

# **Influence Agenda Setting Through Twitter for Health Promotion**

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**In the Name of Allah, the Most Gracious, the Most Merciful**



إليك أبي.. أحملها إليك على جناح دعوة صادقة، أرجو فرحك بها ورضاك عني

**To my dear father. With a heartfelt prayer,**

**I dedicate this to you, hoping you are proud of this work and of me.**

## **AUTHOR'S DECLARATION**

I declare/certify that, except where acknowledged, all parts of this thesis were undertaken by myself. The information contained in this thesis has not been used to obtain a degree in this, or another University.

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Yousef Albalawi

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## **ABSTRACT**

We are in what is known as the new media era, and it impacts all dimensions and aspects of people's lives. Through advanced technology and the internet, new media continues evolving to change people's lives so that they rely heavily on it for communication. The revolution of new media through various tools, channels and platforms requires that many of the classic and traditional presuppositions about communication are reviewed and revised. This extends to all domains of life including that of health. The promotion of health using new media lacks the research basis for effective application in practice. The purpose of this study is to explore the ability of traditional communication theories in understanding and using new media for health promotion. It does this in the context of the dissemination of tweets about road traffic accidents in Saudi Arabia.

The study utilised an agenda-setting function from communication theory as a general framework through a three-stage research structure. The first stage focuses on the identification of influential opinion leaders in diffusing their influence among users of the new media channels. The study examined several methods and tools to identify these opinion leaders and to evaluate their impact in influencing others. In total, 99 Saudi Twitter influencer accounts were identified. In addition these accounts were classified to investigate the influential groups among Saudis who were 25 religious men/women, 16 traditional media, 14 sports related, 10 new media, 6 political, 6 company and 4 health accounts.

The second stage used the Diffusion of Innovations Theory to examine how this influence can spread. The study investigated different statistical measures and indicators to understand how the diffusion of influence can be evaluated and enhanced. It utilised the innovation/imitation coefficients ( $p$  and  $q$ ) Bass Model, a model of Diffusion of Innovations to propose an informative indicator of successful tweets diffusion. Moreover, the results provided a primary evaluation of using traditional communication message design for new media communications.

The third stage explored the effectiveness of using agenda-setting for health promotion in the new media era. It proposed adaptations to the agenda-setting model to be explored reflecting two levels of engagement: agenda setting within the new media sphere and the position of new media within classic agenda setting.

Multiple hypotheses were developed to test these two levels of engagement. The results showed significant ratification of the study hypotheses at both levels of engagement proposed in the model adapted for Agenda Setting in the new media era.

The findings from the study identified the key influentials on Twitter in Saudi Arabia. This group can be used to promote health. Indicators to evaluate the diffusion processes were also identified in relation to the Diffusion of Innovations Theory. This can inform further development of health promotion practices. Most importantly the study findings support the proposed adaptation of agenda setting in the new media era. This will facilitate innovative programmes using new media platforms. Traditional communication theory can provide some insight into the best use of new media but the uniqueness of new media must be reflected in the development of communication theory for health promotion.

*Keywords: health promotion, Agenda Setting, Saudi Arabia, road traffic accidents,, Twitter, Diffusion of Innovation, new media, health communication*

# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

The world today is a digital world where people connect and communicate through channels and platforms supported by high speed internet and highly advanced technology. The evolution of the digital world and internet era offers multiple tools and platforms that can be effectively used for health promotion activities and programmes. It provides opportunities to enhance the targeted impact of such programmes at planning, design, implementation, and evaluation stages (Murray et al. 2005; Portnoy et al. 2008). More than just effective tools and platforms, this evolution opens new horizons for health promotion supported by the key features of high reach ability, interactivity and accessible big data (Korda & Itani, 2013; Kass-Hout & Kass-Hout, 2013). However, their effective use requires new levels of knowledge as well as the development of stronger theoretical foundations (Webb et al. 2010; Lupton, 2014; Korda & Itani, 2013). Therefore, research is necessary to understand health potential of these platforms, including how these tools and platforms work, what is most effective, how to measure outcomes, and how to interpret the results of the outcomes measured (Korda & Itani, 2013).

Research can enhance the use of media in health promotion by establishing accurate parameters to track and collect data needed for planning and the development of strategies (Lupton, 2014). It can provide clear frameworks for more effective intervention designs and implementation (Roberts et al., 2002; Korda & Itani, 2013). Moreover, it can establish evidence-based tools, measures, and references for the evaluation of these interventions (Evers, 2006; Powell, 2010; Fernández-Luque & Bau, 2015). Research efforts must include the testing of new media platforms and tools, and the subsequent development of new tools for health promotion practice based on sound theoretical foundations (Fernández-Luque & Bau, 2015). This will allow the innovation of new approaches and techniques for health promotion using new media platforms (Keller et al. 2014).



The broad aim of this study is to explore the capacity of traditional communication theories in understanding the communication processes in the new media era and with new media platforms. In particular, the study aims to examine the capacity of these communication channels in influencing specific health agendas. Agenda Setting Theory (McCombs, & Shaw, 1972) will provide the basis of how this influence will be communicated using the interactions on these platforms, while the communication theory Diffusion of Innovations (Rogers, 1962), will provide the framework within which to understand the dissemination of influence.

The study focuses on an important public health concern in Saudi Arabia that of road traffic accidents (RTAs) (Peden et al., 2004). Using Twitter social micro blogging service as the research platform, the study utilises an agenda setting approach as an explanatory frame of influence, while drawing on Diffusion of Innovations Theory to assess the dissemination and distribution of that influence through Twitter messages. Diffusion of Innovations Theory components are explored to identify how these components can affect the influence of the agenda. These two components are: the role of influential s/opinion leaders, and the importance of the diffusion process in enhancing the distribution of the influence. The role of influentials/opinion leaders contributes to the Diffusion of Innovations within the context of Agenda-Setting. This provides a coherent structure through the study as illustrated in figure 1.

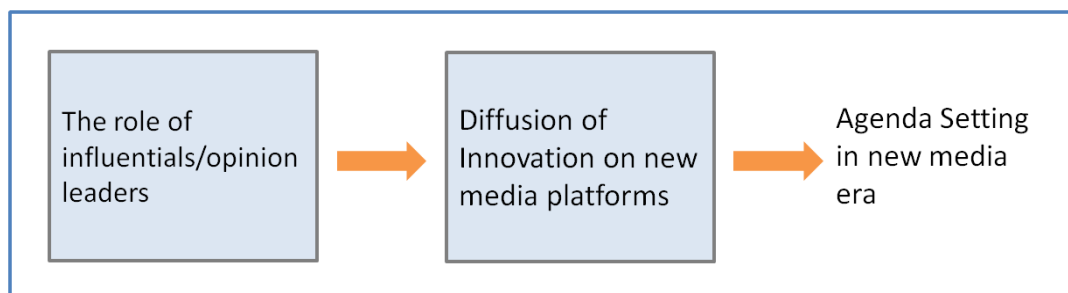


Figure 1: Three-stage structure of the study.

This introductory chapter provides an overview of the main components of this study. Firstly, it will introduce the use of new media for health promotion, and then using the three-stages of the study as presented in Figure 1 as a framework, it

provides a rationale for the use of agenda setting and the Diffusion of Innovations Theory including consideration of the role of influentials /opinion leaders. The chapter will then identify gaps in research and illustrate the importance of exploratory research for this topic area. Finally, the chapter will state the general aim and the research questions addressed in the study, with a brief reference to the study context and its relevance.

## **1.2 New Media for Health Promotion**

Health communication is a key tool for the promotion of health. In recent years' potential channels for health communication have expanded with the development of new media. Supported by technologies such as high speed internet and mobile devices, new media platforms, including Twitter, have become part of daily life for many people. A feature of these platforms is that all data can be recorded, collected and analysed using various tools.

New media provide many promising channels and platforms including, for example, communication interventions, evaluation, surveillance, and promotion of health literacy (Kass-Hout, & Alhinnami, 2013; Mairs et al., 2013; Roman, 2014; Tonia, 2014; Moorhead et al., 2013). However, these initiatives have a limited research evidence base resulting in less than optimal practical application in the field, making the effectiveness and usefulness of new media for the promotion of health unclear for researchers, practitioners and policy makers (Best et al., 2014; Grajales et al., 2014; Bik, & Goldstein, 2013; Moorhead et al., 2013). As new media platforms, such as Twitter, become a vital part of people's lives, the vast amount of data they generate provide great opportunities for researchers to understand, explore, and examine their use in health promotion.

Korda and Itani (2013) pointed out that the traditional theories and models of health promotion can provide valuable references for understanding the use of new media for health promotion. This is validated by the findings of the meta-analysis conducted by Webb et al. (2010) to examine the impact of the theoretical basis of using the internet to promote health behaviour change. The findings confirmed the positive impact of such a theoretical basis, indicating the importance of adopting evidence-based frameworks from these theories (Webb et al. 2010). However, as

the new media are forms of communication, communication theories for the effective understanding and use of new media in health promotion are needed.

### **1.3 Communication Theories**

Theories are fundamental to health promotion practice as they explain the determinants of behaviour and decision making. (Corcoran, 2013; Glanz & Rimer, 1997). Furthermore, they offer a solid basis from which to explain and predict the social interactions that have impacts on health (Corcoran, 2013; Glanz, & Rimer, 1997; Raingruber, 2014). Many classic communication theories can provide well-established frameworks for the process of communication involved in health-related interventions (Atkin, & Rice, 2013).

As clarified early in the three-stage structure, this study seeks to investigate using an Agenda Setting Theory through exploring the influentials/opinion leaders function, Diffusion of Innovations, and lastly the Agenda-Setting approach of new media, specifically Twitter. Agenda setting (McCombs, & Shaw, 1972) and Diffusion of Innovations Theory (Rogers, 1962) are two examples of the central theories applicable to the health promotion domain (Atkin, & Rice, 2013).

### **1.4 Upstream health promotion and Agenda Setting Theory**

It is recommended that health promotion practices focus on social systems, not just on changing behaviours and habits of individuals (Bandura, 1998; Raingruber, 2014). Many individual behaviour change theories and models have provided explanations for public health communication of how social factors can affect people's health (Bandura, 1998). These theories include the Health Belief Model (Becker, 1974; Rosenstock, 1974), Social Cognitive Theory (Bandura, 1986; 1997), and the Theories of Reasoned Action (Ajzen, & Fishbein, 1980), Planned Behaviour (Ajzen, 1985) and Protection Motivation (Rogers, 1962). However, these theories have been criticised for focusing on individual behaviour ignoring other factors such as the influence of socio-cultural factors (Raingruber, 2014). Health is a social matter which requires a broad approach beyond the individual (Bandura, 2004). McLeroy et al. (1988) proposed a model with an ecological perspective that added a social environmental dimension to the individual factors

in health promotion interventions. Likewise, Terris (1968) indicated that public health must be considered as a social field, and its problems can only be solved in terms of social policy. This upstream framework is supported by the core function of health promotion. Among the six actions proposed in the Ottawa Charter for Health Promotion, the World Health Organization (WHO) (1986) indicated that setting a health agenda and building healthy public policy are key strategies for health promotion. Furthermore, the Charter endorses strengthening community action through involving everyone in setting priorities that support better health as another strategy. Health promotion can indirectly promote health behaviour by utilising the agenda setting function to influence health agendas (Atkin & Rice, 2013; Kozel et al., 2006).

Agenda setting is a communication function that prioritises salient issues through the domains of media, policy, and the public (Dearing & Rogers, 1996). It is an informational function that enable media to transfer prominent issues through agenda (Kim et al. 2002). As explained by Kim et al. (2002 p. 3), it does so by “an information processing which assumes that - at any given time- some pieces of information are more accessible in a person's mind than others”. They emphasize that the decision making process can be considered as a “function of how easily accessible certain relevant considerations are in a person's mind when he or she makes the decision” (Kim et al. (2002 p. 3).

By using agenda setting, specific health issues, programmes, and policies are viewed as important issues. Agenda setting can change how a specific health problem is perceived as a public health issue (Backer et al., 1992; Kozel et al., 2006). This approach requires design and implementation strategies that initiate the influence, and maintain its diffusion through agenda setting processes (Kozel et al., 2006).Diffusion of Innovations Theory

The Diffusion of Innovations Theory (Rogers, 1962) is a communication theory that explains how the adoption of ideas/information/products/innovations increases and diffuses through a specific social system over time. The relationship between agenda setting and Diffusion of Innovations has been examined from various perspectives (Vu, & Gehrau, 2010; Walker, 1977; Singhal & Quinlan, 2006; Hays, & Glick, 1997; Rogers, 1962). The current study focuses on investigating the

agenda setting function within the context of the new media, bearing in mind the vital role of understanding the process components of Diffusion of Innovations Theory as a mediating process in the agenda setting function.

Social interactions, which build on personal influence, mediate the diffusion of influence (David et al., 2006) which has been previously examined (Peters, & Kashima, 2015; Kempe et al., 2003). As agenda setting is about “the ability to influence the salience of topics on the public agenda” (McCombs, & Reynolds, 2009 p.1), the diffusion of this influence is a core process within agenda setting (Vu, & Gehrau, 2010; Kozel et al., 2010). Maximising diffusion through the development of scientific based strategies must be integral to health promotion practices when they utilise agenda setting (Kozel et al., 2006). Studies support enriching the understanding of the diffusion process, particularly at the level of the individual (Mahajan et al., 1990). Likewise, models of diffusion can provide a reference for a well-framed understanding by exploring diffusion variables and factors, generalising the interpretations of parameters, and providing usable applications (Mahajan et al., 1990; Meade, & Islam, 2006; Rand et al., 2015). Examples of research efforts in modelling diffusion include the Bass Model (1969), Kamakura and Balasubramanian Model (1988), and the Independent Cascade Model (Kempe et al., 2003).

### **1.5 Influence and opinion leaders function**

Using the concept of influence can clearly strengthen health promotion evidence-based practices and support their diffusion (Guldbrandsson et al., 2012). Engaging influentials/opinion leaders in public health practices and using them as active participants in such programmes can have a powerful impact on health promotion efforts. In addition, influentials/opinion leaders can work as change agents within the communities targeted by supporting the health promotion programme and by enhancing its diffusion process (Valente, & Davis, 1999). This is validated by a study by Bakshy et al. (2011) that found that influentials/opinion leaders can be a cost-effective promotional tool. Therefore, it is possible that using influentials/opinion leaders for health promotion on new media platforms will have the same positive impact on promotional objectives and their diffusion as in other fields (Romero et al., 2011).

It has been suggested that some people can be more influential than others in their ability to enhance the agenda setting process (Cobb & Elder, 1971; Berkowitz, 1992). It is crucial that these people, who are usually policy makers and/or opinion leaders, must be involved in any agenda setting intervention plan (Cobb, & Elder, 1971). This position of opinion leaders within the agenda setting process can be conceptualised based on the Two-step model (Lazarsfeld, 1944) and Diffusion of Innovations Theory (Rogers, 1962), which propose a key role for opinion leaders in passing information or innovations on to others (Nisbet, & Kotcher, 2009; Brosius, & Weimann, 1996).

## **1.6 The gap in research**

New media is an important form of communication in daily life, and is therefore an important area of research for health promotion evidence-based practices (Roberts et al., 2002). Developing an evidence-based foundation for best practice requires high quality research to explore new media. This has been repeatedly identified by many agenda setting studies in the health domain (Wong et al., 2014; Best et al., 2014; Roberts et al., 2002; Gurman et al., 2012). Other identified areas to investigate are the diffusion process (Im et al., 2011) and the role of influentials/opinion leaders (Valente, & Pumpuang, 2007). The exploration of the large amounts of data generated by new media, often referred to as ‘big data’, is vital; reflected in the immature and yet to be standardised methods currently used in health research and practice (Russell Neuman et al., 2014; Roberts et al., 2002; Gurman et al., 2012). New media has multiple characteristics that must be considered in practice and research across all domains of science and life, including health promotion (Russell Neuman et al., 2014). These characteristics support the view that new media is an independent communication channel, not reliant on traditional media or policy interests (Russell Neuman et al., 2014).

In agenda setting research, refining research methods to match the nature of new media is central (Roberts et al., 2002). Moreover, considering the evolution of new media in finding research problems and questions can require advanced scientific efforts (Russell Neuman et al., 2014). Most of the available studies are restricted to concepts and ideas adopted from the understanding of traditional communication, and consider new media as just an additional medium. This has led to new media

research being undertaken within the template provided by traditional media, rather than developing new understandings by addressing new media appropriate research questions (Im et al., 2011).

## **1.7 Exploratory research**

The gap in the research of new media and its impact on public health and health promotion is clear. This research field is expected to attract more attention and will require more effort. Thus, it can be considered as a new line of research in the public health and health promotion domain. As such, exploratory research is an essential starting point that provides a valuable grounding and solid foundation for the study of the use of impact of new media on health services and interventions (Wong et al., 2014). The basis of confirmatory research is usually provided by previous exploratory studies and “ideas come from previous exploration more often than from lightning strokes” (Tukey, 1980 p.1).

Goeman and Solari (2011) suggest three main features that characterise the nature of exploratory research. The first is that exploratory research design allows some false positive results. These false positive results can make a constructive contribution by exclusion of the related findings before further validation (Goeman & Solari, 2011). The second is that exploratory research is flexible with regard to formulating hypotheses due to the fact that it is post hoc, which provides flexibility in making decisions regarding inferences after analysing the data (Goeman & Solari, 2011). The third is that the study employing the exploratory research approach is in a real world context. Real world research lacks control as it is conducted in an open sphere where various factors can easily impact it (Robson, 2002).

## **1.8 The current study**

This study will explore the capacity of traditional communication theories in understanding new media channels related to health promotion practices. Firstly, the study aims to investigate the role of influentials/opinion leaders in influencing people on new media platforms. This includes how those influentials/opinion leaders can be identified, characterised, and classified according to new media

indicators and variables. Secondly, the process of diffusion among new media users in the light of Diffusion of Innovations Theory will be explored. Thirdly, the use of agenda setting for health promotion in the new media era will be considered. An exploratory research design has been adopted for this study of RTAs in Saudi Arabia as a public health problem, and Twitter, as an example of a new media platform. The main research question is:

*RQ: How Does Twitter influence agenda setting in public health/health promotion in the context of road traffic accidents in Saudi Arabia.*

Three sub-questions were also considered to cover the three targeted parts of the research:

*RQ1-1: Who influences Saudis on Twitter?*

*RQ1-2: How are tweets disseminated among Twitter users?*

*RQ1-3: How does agenda setting work on a Twitter platform?*

These questions will be considered in the context of RTAs as a public health topic, Twitter as an example of a new media platform, and Saudi Arabia as the research population. The next section provides a brief review of these components.

To answer these questions, evidence informed tweets about RTAs were developed and disseminated through the Saudi Arabian Ministry of Health account on Twitter. In addition to the data of this intervention, data of three keywords mentions related to RTA were planned to be tracked among all Saudi users.

Just one week prior to the interventions dissemination, a national campaign on road safety commenced disseminated via multiple channels including: television, newspapers, and various new media platforms. This campaign was led by the Disabled Children's Association of Saudi Arabia with backing from the Saudi ruling family. It was unknown until one week before the intervention was planned to be disseminated and the initiative was instigated outside the Ministry of Health. This meant that the Ministry curtailed the planned timeframe for dissemination of the planned approved tweets. This campaign reflects the normal dynamics of real-world interactions which were targeted for examination by the study. As a result, data of the interactions were collected before the intervention, during the



communication, and after. Moreover, to extend the investigation of agenda setting beyond the new media the data of mentions of the same keywords for the same period were tracked in 6 popular Saudi newspapers.

## **1.9 Study context**

Road traffic injuries are predicted to rise to become the fifth leading cause of death globally by 2030 (Peden et al., 2004). In Saudi Arabia 544,000 accidents a year have caused 7,153 fatalities and more than 39,000 injuries (Ageli & Zaidan, 2013). New media has been used in health promotion prevention activities aimed at road traffic accidents, and evaluation reports showed effective and successful campaigns (Global Road Safety Partnership, 2012; Murray & Lewis, 2011). Twitter has more than 316 million monthly active users posting more than 500 million tweets every day in more than 35 different languages, including Arabic. In addition, Saudi Arabia has more than 18 million internet users among its population of 27 million (Internet World Stats, 2015). It is considered one of the most active countries on Twitter, with more than 60% of registered users among internet users, and ranks first globally based on logged-out user statistics (Global Web Index, 2015a).

## **1.10 Outline of thesis structure**

The overall structure of this thesis will use the following chapters to address the research questions:

Chapter 2 reviews the main topics of the related literature, including understanding the new media according to communication theories, the role of opinion leaders/influentials in understanding the process of influence diffusion within new media platforms, utilising new media in health promotion, and the agenda setting function and its position in the new media era. In addition, the chapter will cover study context components including the public health topic of the study, RTAs, the new media example platform, Twitter, and Saudi Arabia. The chapter concludes with the study aim and objectives and reiteration of the research questions.

Chapter 3 outlines the methodological basis of the study, highlighting the chosen research design and its rational in relation to the study research questions. The chapter explains how the pilot study and the main intervention have been designed,

implemented, and evaluated. It provides details about the procedures and methods employed by the study, emphasising the use of new media tools in collecting and analysing data.

Chapter 4 provides a summary of the key findings as reported in three peer reviewed published articles. Additionally, it presents extra results not covered by these articles.

Chapter 5 discusses the findings of the study according to the reviewed literature. The chapter presents the discussion of the various results based on the third stage, agenda setting in the new media era, to provide a consistent answer to the research questions of the study. The chapter ends with suggestions of relevant further research and implications, outlines of the limitations of research, and a general conclusion.

Appendix 1 includes the three articles relating to the study accepted for publication in peer reviewed journals.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter will provide an assessment of the research related to topics that are relevant to the study question and sub-questions. The chapter will explore health communication in the new media age as an effective tool for health promotion. Firstly, health communication as the main domain of this study will provide insight for the term new media from the perspective of communication theories. The definition of new media will be investigated, and then traditional communication theories will be considered in relation to new media. This will provide important insight into understanding the use of new media for health promotion.

This chapter will review the literature in relation to the main topics of the three-stage structure adopted to find answers to the study question and sub-questions, regarding the influentials/opinion leaders' role, Diffusion of Innovations Theory, and the agenda setting function. The chapter will identify existing knowledge of these topics and address the rationale of these topics for the study. Then, the chapter will address the related literature of using new media for health promotion. This includes the design of health promotion interventions for new media platforms based on scientific research. Finally, an insight into the research context using Twitter as an example of a new media platform and Road Traffic Accidents (RTAs) as a public health topic in relation to Saudi Arabia, the country where the research is applied, will be given. This chapter concludes with the presentation of the research questions aligned with the study aim and objectives in the context of the structure of the study as a whole.

### **2.2 Health Communication**

This study aims to explore the capacity of traditional communication theories in understanding the communication processes in the new media era and within new media platforms. This aim falls under the domain of health communication. Health communication has been defined as "The art and technique of informing, influencing, and motivating individual, institutional, and public audiences about important health issues. The scope of health communication includes disease

prevention, health promotion, health care policy, and the business of health care as well as enhancement of the quality of life and health of individuals within the community" (Healthy People, 2010, p. 11 – 20). It includes the use and application of communication strategies to influence individual, community and societal decisions that enhance health. It is recognised as an important element to improve individual and public health (Healthy People, 2010).

Communication is an important component of any change process, and in many areas of health promotion it is central to effective information, prevention, and awareness programmes and campaigns at the individual and community levels (Frati, Luzi, & Colucci, 2010). Furthermore, with advances in communication evolving through technology and internet development, the role of health communication is increasing, with the potential to empower individuals and communities (Biggeri & Tallacchini, 2015; Tomori et al. 2014; Nutbeam, 1998). Consideration of what new media is and how it works is essential to gain an understanding of how it can be used in health promotion. The next section will provide insight into understanding new media.

## **2.3 New media**

According to Internet World Stats (2015), the number of users of the internet at the end of 2014 was 3,079,339,857, out of the 7,264,623,793 world's total population. This means that globally more than 42.4 percent of all people are using the internet, with some of the highest usage related to social media platforms.

Many social networks have originated on the internet, with numerous new successful networks added every year. The most well known social networks targeting the global internet population include Facebook, Twitter, YouTube, Google+, LinkedIn, Tumblr, Instagram and Pinterest, amongst others (Global Web Index, 2015b). With the exclusion of China, it is estimated that 91 percent of internet users aged 16 to 64 year visit YouTube, Facebook, Twitter or Google+ monthly, according to the Global Web Index (GWI) Social report (Global Web Index, 2015b). These users spend 28 percent of their internet time each day on social networks (Global Web Index, 2015b). Social networks are growing rapidly,

supported by new internet devices like smartphones and tablets, in addition to classic PC devices.

Moreover, the availability of new media, including new social platforms, has significantly increased in recent years, which is expected to continue (Murray & Lewis, 2011). Social platforms have become an effective channel to use in any communication based activity. This is due to powerful features that have characterised this generation of media such as interactivity, mass customisation, controllability, networkability, density, compression, and convenience (Flew, 2005, Powell, 2010; Evers, 2006).

### *What is the new media?*

Although the first use of the term "new media" was by McLuhan in 1953 with reference to a specific type of media that was novel at that time and had characteristics like global reach and electronic information collection methods. Since 1990 the use of this term has increased sharply. It is clear that the technologies have many features with seemingly limitless possibilities. Today's technology is just a temporary media tool which was previously unavailable and may become redundant in the not too distant future, according to Peters (2009).

Peters (2009) provided a definition based on the principle of recurrent change, saying "new media can be understood as emerging communication and information technologies undergoing a historical process of contestation, negotiation and institutionalization" (p. 18). Using this definition, he explained five stages of modern media: technical invention (media not yet considered as 'new'), cultural innovation (new social uses developed by media), legal regulation (media power negotiated at policy level), economic distribution, and social mainstream (media no longer new). Manovich (2001) defined new media as "the cultural objects which use digital computer technology for distribution and exhibition". Manovich (2001) tried to describe new media by clarifying the relationship between it and many other modern cultural contexts as in the following:

- New media versus cyber culture. Cyber culture is social and networking, while new media is about culture and computing.

- New media as computer technology used as a distribution platform. New media does not include any other media such as magazines, books, television programmes, cinema, etc. which use computer technology for production or storage, but not for final distribution.
- New media as digital data controlled by software.
- New media as the mix between existing cultural conventions and the conventions of software.
- New media as the aesthetics that accompanies the early stage of every new modern media and communication technology. That is, there is no unique media called "new media" and this understanding will redirect the research efforts to focus on the aesthetic techniques and ideology tropes that accompany each modern media.
- New media as a faster execution of algorithms previously executed manually or through other technologies.
- New media as the encoding of modernist avant-garde; new media as meta-media, meaning what is related to post-modernism.
- New media as parallel articulation of similar ideas in post World War II art and modern computing. Although not related to technology, it is by humans; thus, is considered as an important part of new media.

In summary, the use of the term “new media” is most likely to describe traditional media like books, television, and radio, joined with the new digital media like social networks, emails, and blogs (Ito et al., 2008). It is obvious that new media is more relevant to exhibition and distribution rather than production (La Manovich, 2001; Ito et al., 2008). A further, more in depth scientific understanding of communication and media action theories and models is essential for the most effective use of new media. This includes the traditional communication theories; new media may not fit into these theories; however, they are necessary to inform understanding of how the media can be used in health promotion.

## **2.4 Communication theories for new media**

Theories are symbolic ways for researchers to understand phenomena. They are used to explain, describe, understand, or reform the mechanism of a specific process. One of the uses of theories is to explain how something works (Wood, 2004). Thus, the theorists who formulated the theories of communication tried to represent understandable frameworks for how the communication process happens between people. According to Conrad and Poole (1998) communication is the process by which people create, sustain, and manage meaning interactively. It is a symbolic process “whereby reality is produced, maintained, repaired, and transformed” (Carey, 1989, p. 23). Furthermore, communication theory can be defined as “any systematic summary about the nature of the communication process” (Dainton et al. 2014 p. 3).

Yet, Craig (1999) emphasises the idea, suggested by Dance (1970), that proposes understanding communication as a “family of related concepts rather than a unitary concept” (p. 210). He utilised the significance of communication as a meaningful concept in everyday life practices to provide a definition of communication theory built on practical rather than theoretical ideas. Adopting this approach new media can be understood according to various communication theories in light of its impact on people’s everyday life. New media can be considered to be a mix of many types of communication and hence multiple types of models are relevant. The variety of tools, level of engagement, types of communication, amount of information, and the amount of interactivity will all affect the application of communication theories to new media. Traditional communication theories were developed in relation to simple classic media. However, the new media platforms are combined with more than one component or variable leading to a complex conglomerate of media, and indicate the need to use these theories in new ways, as a combination of more than one theory, as adaptations of theory, or for developing new theories or models. Beyond the theoretical conceptualisations, ignoring the need of a new level of understanding will hinder the effective use of new media (Morris & Ogan, 1996).

## 2.5 Lasswell’s Formula

Although it is a very early model of communication, Lasswell’s Formula (Lasswell, 1948) explained the process of communication in a simple and understandable way. The questions who? says what? by which channel? to whom? and with what effect? are framed in the process of communication, and are used in different ways to understand the communication process (McQuail & Windahl, 1995). In an attempt to provide further understanding of new media, it is useful to use this primary formula as a theme to frame the components of the new media process, by embedding other communication theories within it. It is notable that many theories can fit into more than one part of the formula. The proposed theme focuses on the significant meaning of each theory in understanding the new media from a practical everyday perspective. Table 1 illustrates the relevance of this formula of questions to new media.

Lasswell formula questions	Relevance to new media
‘Who?’	New media has a role in changing the balance at the level of the actors engaged in the process of communication; it enables any individual or organisation to be a sender in its communication processes (McMillan, 2002).
‘Says what?’	New media does not differ from traditional media content (La Manovich, 2001; Ito et al., 2008). Yet understanding the role of messages in the new media process can improve design and implementation.
‘By which channel?’	The main evolution for new media is about this element. Technology, internet, and modern tools provide new channels to distribute and exhibit message content.
‘To whom?’	In new media, the balance of control of power shifted to receivers in selecting and controlling what, when, and how they will engage in the communication process.



‘With what effect?’	When compared with traditional media, the outcome of new media is on a greater scale in most measures, such as speed and size.
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Table 1: The relationship between the Laswell formula questions and new media.

2.5.1 *The Sender ‘Who?’*

New media has a role in changing the balance at the level of the actors engaged in the process of communication; it enables any individual or organisation to be the sender in its communication process.

Most traditional communication theories considered the sender as an inflexible element in the communication process. However, many theories stress the role of the sender as an essential component in the process. This includes theories and ideas of Persuasion, identified by Simons (1976, p. 21) as "human communication that is designed to influence others by modifying their beliefs, values, or attitudes". O’Keef (1990) suggested that elements of the Persuasion process include: the sender of the message, the means to disseminate the persuasive message, and recipients of that message. The sender must have a goal and intend to achieve this goal. Another theory is Interactivity Theory which involves multiple communication elements, including the sender. McMillan (2002) recommends using traditional as well as new developed theories to understand the variety of levels of cyber-interactivity among internet platforms.

2.5.2 *The Message ‘Says what?’*

The content of new media is very similar, if not the same as that of traditional media. For example, images, texts, both spoken and written, as well as video are found in both (La Manovich, 2001; Ito et al., 2008). The purpose behind communication in new and traditional media is also similar in that they both: provide information, opinions, attitudes and ideas. Nevertheless, a greater understanding of the role of the message in the new media process can contribute to effective message design and implementation. Persuasion and Interactivity Theories can inform our understanding. This indicates that other theories developed from and explaining traditional media may provide insight into message development for new media.

Another potentially valuable theory is Media Richness Theory. Daft and Legel (1986, p. 560) identified media richness as "the ability of information to change understanding within a time interval". The theory is founded on the concept that the main goal for any communication is to reduce uncertainty; therefore, media differ from each other in their ability to resolve ambiguity. This theory can be applicable to new media platforms, and can be examined to provide informative explanations for these platform functions (Kaplan & Haenlein, 2010). The theory is unique in that the user can choose one of many communication modes, such as: written words, voice inflections, and non-verbal forms of communication. New media platforms have provided many innovative applications that use these modes. Of course, new media has many tools that clearly support face-to-face communication, such as messaging mobile applications (apps).

### *2.5.3 The channel 'By which channel?'*

The main area of development of new media is in relation to channels. Technology, the internet, and modern tools are new channels through which to distribute and exhibit content. As a result of the abundance of new channels and platforms new media has provided an ideal sphere for social interactions and thus, social influence. Likewise, there is no doubt that new media provides effective channels and platforms to use the persuasion principle as a communication framework (Theunissen, 2015).

Medium Theory (Meyrowitz, 1985) provides an essential base from which to understand new media. McLuhan (1964) suggests that not only the media itself, but also the ways in which it affects social life are important. He emphasises that the media channel is powerful in the communication process; therefore, it is necessary to understand how the media causes effects. Each channel has unique attributes and characteristics and so has the potential to generate different effects. Qvortrup (2006) discusses the application of Medium Theory over time through previous eras that used different media such as oral, written, and print. He sums up "The computer and the digital network is a medium that can copy any other medium." (p. 6).

#### 2.5.4 The receiver 'To whom?'

There is a clear role for the receiver in the communication process in both Persuasion and Interactivity Theories. In new media, the balance of the control of power shifted to receivers in selecting and controlling what, when, and how they will engage in the communication process.

The new media platforms support many new types of two-way communication. Direction of communication and control over the communication process are considered as primary dimensions for the individual communicators model (Downes & McMillan, 2000). The level of receiver control is the challenging element of a computer based information system (McMillan, 2002), so, this model is classified into four parts based on the direction of communication as illustrated in Table 2.

		Direction of communication	
		One Way	Two Way
Level of receiver control	High	Feedback Sender > Receiver	Mutual discourse Sender/Receiver interchangeable role
	Low	Monologue Sender < receiver	Responsive dialogue Sender <> receiver

Table 2: Direction of communication and control according to the individual communicators model (Adapted from McMillan, 2002).

Many recent studies were based on the Uses and Gratifications Theory to explain new media effects (Flanagin, 2005; LaRose, Mastro, & Eastin, 2001; Leung, 2001). The Uses and Gratification Theory asserts that people turn to mass media because of psychological motivations for gratification (Flanagin, 2005). Katz (2001, p. 1065) explains this theory as "it is not what media does to you but rather what you do with the media". The audience in this theory has control over what they want to receive from the media sources, according to their needs (Sixsmith, 2006).

LaRose and Eastin (2004) suggested, in relation to the internet, a model for media attendance built on the Social Cognitive Theory in combination with the Uses and Gratifications Theory. Many of new media features provide an extensive choice

through the multi-level processes. The audience has a wide area to choose from, so understanding this theory is useful to show how new media affects its audience. In addition to the theories already reviewed, many theories have been significantly impacted by the evolution of new media. Assessing the communication process of new media according to these theories may provide a more valuable basis from which to understand the new media.

## **2.6 Other Communication Theories Relevant to New Media**

### *2.6.1 Mass Media and New Media*

Mass media can be simply defined as “large-scale distribution and reception of content” McQuail (2010 p. 58). The difference between targeted communication and mass communication is based on the features and uses of both (Flora et al. 1989). For instance, mass media has the power to reach a large audience, but it lacks differentiation for more specific interventions, and vice versa for targeted media (Flora et al. 1989). Within this context, the various features and tools of new media provide communication characterised by features of both targeted and mass communication, with potential reach and customisable interventions. This essential attribute can help to bridge the gap between micro (individual) and macro (societal) level interventions. Bridging this gap has been identified as one of the greatest challenges in health promotion practice (Abrams et al. 1986).

From interpersonal versus mass communication perspectives, McQuail (2010) indicated that new media can work for mass and personalised communication. Another opinion is that new media merges interpersonal and mass communication into one communication type with multifaceted characteristics (Morris & Ogan, 1996; Poole & Jackson, 1993). This emergent communication is a challenge to the traditional communication theories in providing models capable of informing understanding (Morris & Ogan, 1996; Poole & Jackson, 1993). However, a new level of understanding of these traditional theories can provide a promising framework within which to explore new media and the relationship between interpersonal and mass communication, (Lazarfeld et al. 1944; Chaffee and Mutz, 1988; Morris & Ogan, 1996).

### 2.6.2 *Media features*

The media features perspective to understanding cyber-interactivity communication explores the answers to "how many? and what types of features allow for interactive communication?" (McMillan, 2002 p. 7). Many researchers have tried to identify these features which provide the interactivity for web-based communication (Massey & Levy, 1999; Ha & James, 1998). The relationship between tools, or the features of interactivity, and communication has been made very clear through this research. McMillan (2002) linked the mechanism of these features with the essential dimensions of the other three models (table 2). He suggests that the features are either to facilitate two-way communication or enhance receiver control over the communication process. The feature-based on the user perspectives is considered the main gateway to understand the effects of interactivity of the communication. User Generated/Created Content (UGC/UCC) is one of the most potent features of new media. Examining the impact of this feature will enhance the understanding of new media.

### 2.6.3 *User Generated/Created Content (UGC/UCC)*

UGC is one of the unique features of new media. It empowers users through a new level of social interaction to participate in fast content creation and distribution that doesn't need much effort to create the content (Cha et al. 2007). How users create, distribute, and share content and information gives the new media era a huge opportunity to impact people's lives via powerful communication with various implications including sharing knowledge and culture in communities, creating and enhancing policies, and participating in economic and business opportunities (Cha et al. 2007; Vickery & Wunsch-Vincent, 2007; Dellarocas, 2006).

Vickery and Wunsch-Vincent (2007) define UGC/UCC as "i) content made publicly available over the Internet, ii) which reflects a certain amount of creative effort, and iii) which is created outside of professional routines and practices" (p). Kaplan and Haenlein (2010) suggested three requirements of media content as UGC must be published publicly, show some creative effort, and not be generated by professionals. In addition to the internet, Kaplan and Haenlein (2010) proposed the feature of UGC as one of two essential elements that can inform the definition of new media platforms. From a psychological perspective, in the generation and

sharing of content by users, people usually contribute to the content generation seeking in one of three things: connecting with others, self-expression, or to receive recognition and prestige from others (Vickery & Wunsch-Vincent, 2007).

## **2.7 Gatekeeping theory**

Gatekeeping Theory is an important and useful theory to understand the effects of new media platforms (Roberts, 2005). The implications for this theory on new media still need better research (Roberts, 2005). The concept of the gatekeeping Theory is that there is a filtration process of information from the source through to the audience; here, the gatekeeper can be an individual or group. This core concept can be debatable in relation to new media as it weakens the role of any gatekeeping function by giving more control to individuals. This includes the ability to receive any media content, according to their choices, without restrictions. While new media challenges Gatekeeping Theory the concept of a filtering function within the communication process can be aligned to the role of opinion leaders in new media. In this alignment, for new media opinion leaders can be equated to some extent to gatekeepers in traditional media.

The concept of opinion leaders/influentials is explicated in the Two-step Theory (Lazarsfeld et al., 1944) and the Diffusion of Innovations Theory (Rogers, 1962). Both theories emphasize the role of human agency in the communication process through the function of opinion leaders. This will be reviewed with consideration of the Two-step Theory and the Diffusion of Innovations Theory in the following sections.

## **2.8 Opinion leadership**

People are highly influenced by one another, and other people's experiences can affect the behaviour of people. The Social Cognitive Theory (Bandura, 1977) states that within a social context, observing others' behaviour, experiences, and interactions directly influences an individual's behaviour, beliefs, values and attitudes. Proceeding from a logical principle that people who influence others are usually viewed as special people within society, the concept of "opinion leaders" was introduced by Lazarsfeld et al. in 1944 and relied on the two-step flow of

communication (Lazarsfeld et al., 1944). They positioned opinion leaders within a process of diffusion, proposing that ideas flow from mass media to opinion leaders, and then to the rest of the community. It provides a good explanation of how mass media influences decision making (Infante, Rancer, & Womack, 1997).

## **2.9 The Two-step Theory**

The Two-step flow of communication theory (Lazarsfeld et al., 1944) hypothesises that for the information to reach the public, it must move through two stages. Firstly, opinion leaders will receive the information, then, in the second stage they will pass on their interpretations of the media content. Although these opinion leaders receive part of their information from other users, they are more likely to be exposed to the media than others (Katz & Lazarsfeld, 1955). This is supported by Wu et al. (2011) who argued that information passes from its source, such as media, to the population through opinion leaders, who are more likely to be exposed to media than other users. This theory inspired Rogers (1962) to construct his Theory of the Diffusion of Innovations, in which he attributes more power to opinion leaders in influencing other people and their decisions (Rogers, 1962; Valente & Pumpuang, 2007; Guldbrandsson et al., 2012).

## **2.10 Diffusion of Innovations**

Diffusion of Innovations is defined as a multi-step flow and focuses on the conditions related to increasing or decreasing the likelihood of the innovation adoption of individuals (Infante, Rancer, & Womack, 1997). Macdonald (2002) indicated that the Diffusion of Innovations Theory (Rogers, 1962) is one of the most important factors in basic general communication theory, and understanding its mechanism is essential to understand the process of any communication. Moreover, it is one of the most tested and applied communication theories in health promotion programmes (Macdonald, 2002). Schramm and Lerner (1978) indicate that the Diffusion of Innovations Theory includes four key elements: innovation, media channel, time of communication, and members of the community. Rogers (1962) suggested three important elements for the diffusion to be successful: innovation characteristics, individual classification in the community, and interpersonal communication. In his theory, Rogers considered the social networks

and their impact among the communities on the communication process. The process in this theory is about the innovation, communicated by different types of channels over a specific time within a community system (Rogers, 1962). It is a social process, explaining the behaviour of the individual, community and society when a new idea is communicated to them by certain channels over a specific time (Suresh, 2011).

Macdonald (2002) simplified the theory as a communication process of two-way flow, from the new idea source to the recipient. As the idea is diffused within the community, it will be accepted, adopted or rejected; the response will determine the specific consequences, and may result in social change. Rogers (1962) indicated that the normal Diffusion of Innovations classified recipients of the innovations as adopters, early adopters, early majority, late majority, and late adopters. The distribution of these types of adopters follows the time of diffusion and framing. The curve for the rate of adoption is S-shaped. He suggested that many factors can affect the adoption rate such as: time, information source, and acceptance variables. Macdonald (2002) emphasised the information source, not just adoption rate, but also the speed of diffusion.

Understanding the Diffusion of Information is crucial to plan, construct, and intervene for different purposes (Herrmann et al. 2005) including those of public health (Dearing, 2009). To provide a solid understanding of the theory frameworks, many research efforts have explored different types of models that examine and predict the pattern of the Diffusion of Innovations process. One of the important efforts was a model developed for consumer durables (Bass, 1996). The use of this model has been extended for different applications in various services and products (Bass, 2004) including digital innovations within new media communication (Wong et al. 2011; Chang, 2010). Bass model use adopters and the time of their adoption as main parameters to predict the future diffusion of similar innovations (Rogers, 2003; Bass, 1996; Wong et al. 2011). Yet, it can be applicable to utilise such model to evaluate characteristics of active diffusion rather than predicting it. Defining the variables of this model in the digital world can be applied based on individuals'/users' adoption of different types of innovations on new media platforms (Wong et al. 2011). In this study, instead of utilising the mathematical application of the model, the concept of innovation/imitation will use to find



indicators to evaluate the diffusion of tweets. Considering the tweets as innovations, the innovators will be the retweeters from the followers while non-followers retweeters will represent the imitators.

The communication process and roles have changed through the development of new media; the ability to select and filter influentials/opinion leaders has diminished significantly. Moreover, new media transforms the function of influence by adding strong new features to the communication process. This transformation must be reviewed, considering these new features and their impact on the communication process and the influence function (Said-Hung & Arcila-Calderón, 2014). In most cases, the complexity that new media has brought to the communication process is expected to enhance the impact of influentials/opinion leaders in their communities. Benefiting from the shifting balance of power towards the role of the individual (Boyd et al., 2010), the influentials/opinion leaders on new media have more power compared to their counterparts in traditional media. By examining the factors of sharing influence on social media platforms, Ma et al. (2013) found that opinion leadership is the strongest factor. Their results confirmed the crucial role of so called “influentials” on new media.

Diffusion of Innovations is a promising theory in understanding the use of new media (Ma et al., 2014). How information diffuses through new media platforms is an important concern of research (Im et al., 2010). However, many research efforts lack an up to date approach which is needed for this new communication; much research approaches new media as just one more classic communication channel (Im et al., 2010). Obviously, the complexity of new media has presented many new challenges, hindering research within this domain (Im et al., 2010).

## **2.11 Agenda-Setting**

Lippmann (1965) was the primary inspiration for agenda setting; he indicated that mass media links the real world to how we envision these technologies in our minds (Yang & Stone, 2003; Dearing & Rogers, 1996). In 1948, Lasswell put forward “attention frames”, which project media as playing a key role in orienting people’s attention towards specific issues (Yang & Stone, 2003; Dearing & Rogers, 1996). In 1963, Cohen revealed that when people read papers, they view the world in

accordance with the writers' and publishers' opinions that are included in the papers (Yang & Stone, 2003; Dearing & Rogers, 1996). In 1972, McCombs and Shaw introduced Agenda-Setting Theory, which maintains that a relationship exists between the agendas of the media and the public.

The core concept of agenda setting assumes that media stimulates the awareness of people regarding certain issues. This assumption is grounded on two main principles: media shape and filter reality, before presenting it to people. These channels determine the priority with which individuals regard salient issues (University of Twente, 2015). Dearing & Rogers (1996) proposed an agenda-setting model that comprises three components: media agenda, public agenda and policy agenda. The authors re-conceptualised the agenda setting process with salience (i.e. the ranking of issues by importance) as its cornerstone (Dearing & Rogers, 1996). The authors also define the agenda setting process as "an ongoing competition amongst the proponents of a set of issues to gain the attention of media professionals, the public, and policy elites" (Dearing & Rogers, 1996, p. 6). Under this definition, an agenda is a set of issues that is communicated amongst proponents on the basis of the importance of a given issue at a certain point in time.

The three components of the Agenda-Setting Theory - media agenda, public agenda, and policy agenda - represent issues that are the chief concerns of a particular stakeholder. The interrelation amongst these components forms the core of the Agenda Setting Theory (Kosicki, 1993). Media agenda setting refers to traditional media organisations' decisions about which issues to discuss through their channels. Public agenda setting revolves around the issues that are considered important to the general public. The policy agenda setting involves official organisations or government agencies that determine which issues are important and worthy of discussion (Berger, 2001).

Although there has been much research in the agenda setting field, new media as a new faster evolution of communication has not been comprehensively examined by researchers (Sayre et al. 2010). It is expected that, similarly to how traditional media is presented as an important part of the equation of agenda setting, the new media will be there too. It may be the most powerful part of the equation by

supporting the large-scale processes of self-organisation through communication (Bekkers, 2011), and through the richness of the communication content (Dearing & Rogers, 1996).

This review has considered the theoretical basis for the understanding of new media in the light of traditional communication theories. It has shown the importance of this theoretical base in contributing to an understanding of new media. However, it has also highlighted short comings in the application of traditional media theories to new media, with the identification of research gaps.

## **2.12 New media and Health Promotion**

At the 58th World Health Assembly, the World Health Organization (2005, p. 121) stressed that "eHealth is the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research". Health promotion is potentially one field that can benefit from new media, through the internet and mobile communication social networks. There is likely to be increasing potential for the promotion of health through e-health communication using the new media platforms (CDC, 2011; Eng, 2001). This is supported by the characteristic features of the platforms which enhance the audience reach and the level of engagement (Korda, 2011; Neuhauser & Kreps 2003, Kreps & Neuhauser, 2010).

New media can be effective in health promotion, either as a stand alone new media intervention, or in combination with other more traditional interventions (CDC, 2011). The ability of new media in heightened engagement and interaction can complement traditional programmes making them more effective in increasing awareness, distributing influence, and changing behaviour (Abroms, Schiavo, & Lefebvre, 2008). The Centres for Disease Control and Prevention (CDC) (2011), supports this, suggesting that integrating social media networks into other communication programmes outside the new media platforms will influence the impact of activities on new media. One of the strengths of new media is that it has an information-rich environment, and is more able to provide potential measures than any other classic tool (Powell, 2010). Large amounts of detailed data can be

gained from these measures. This will not only support the research process related to health promotion, but will have a strong effect on the evaluation of health promotion strengthening the evidence base.

E-health communication using the new media platforms will result in significantly better outcomes for health promotion because platform features are characterised by mass customisation, interactivity that enables both anonymity and social networking according to participants' preferences, multimodality, the opportunity for users to also be producers, is low cost, and provides broad social connectivity (Korda, 2011; Neuhauser & Kreps 2003; Kreps & Neuhauser, 2010).

Korda (2011) indicates that one of the important characteristics of "web-based interventions" is the impact on people seeking healthy behaviour and wanting to make lifestyle changes because they feel empowered to make decisions related to their health. Focusing on communication as the core of health promotion, Kreps and Neuhauser (2010) discussed the potential of new health communication (ehealth communication) in changing behaviour. They identified strengths that increase the potential of ehealth communication, as compared to traditional health communication. These are:

*Strengthening the theoretical foundation of health behaviour models:*

Reshaping the understanding of health communication to position various elements within the planning of the communication process.

*Creating personal and contextual communication:*

Customisation of social communication networks depending on specific demands, needs, and interest. Engagement users in these networks will influence them to support the communication process by the way of self-motivation.

*Enhancing the interactivity of communication:*

At the individual level, it will deliver full interactivity and control of information provided and furthermore, be a producer of interesting information.

*Designing communication to have the reach of mass media and the impact of interpersonal connections:*

As a result of the combination of traditional media and new media tools, new communication approaches without the traditional restrictions will be formed at the level of mass media or interpersonal media (Kreps & Neuhauser, 2010). The design of the communication process from these developments will enhance the receipt of potential individualised feedback and different choices of interactivity. Health promotion through these electronic tools is considered low cost and effective by decreasing personnel demands. They provide many advantages, including a flexible and interactive data collecting process which encourages participants to provide more honest self-reports (Evers, 2006). Consequently, new media has the potential to make a real impact on health promotion by providing virtual support to its many programmes and established global projects.

These factors provide an informative basis for using new media for health promotion at the individual level. Yet, health must be considered through a social theme not limited to the individual level nor that of behaviour change goals (Bandura, 2004; Terris, 1968). While the new media creates a new context of communication where the margins between individual and community intervention approaches have been blurred, the goals of such interventions must be specified. This concept is built on the strength of partnerships for health promotion as explained by Gillies (1998), whereby the partnerships for health promotion concentrate on outcomes of health rather than specific goals.

### *Challenges*

With all these advantages, there are still many challenges in the use of this promising media. According to Powell (2010), the most important challenge in using new media for health promotion is related to digital exclusion, due to the lack of internet, devices, or required skills. Inequalities among people who cannot engage with the internet will arise as a result of these exclusions. Moreover, these communication inequalities are not limited to internet access, but also include difference in people's usage of new media platforms and applications (Kontos et al. 2010).

Because new media is new, there is a lack of a specific theoretical basis particularly in relation to its functions and characteristics that differ from traditional media. Limited and relatively weak research both theoretical and applied does not provide

the strength of evidence needed for researchers, practitioners, or policy makers. It is challenging to know what is the best most effective use of new media for the promotion of health (Kreps & Neuhauser, 2010).

Although it is fundamentally two way communication, many researchers (Murray & Lewis, 2011; Powell, 2010) argue that measuring and evaluating health promotion projects in new media is a challenge. Particularly, the measurement of the impact of these types of programmes which is considered complicated and difficult. However, evaluating the effectiveness of the promotion process is usually not easy in any type of communication, even those using traditional approaches (Murray & Lewis, 2011). However, new media has many tools and features that support the evaluation process, an advantage over traditional media.

### **2.13 Designing Health Promotion Interventions for New Media**

As well as challenges for evaluation there are challenges for the use of new media in health promotion, particularly in designing appropriate interventions and programmes. The design and development of effective media strategies, based on evidence informed best practice approaches, are key for effective health promotion practices and interventions (CDC, 2012). Many studies have suggested different principles for the ideal intervention design, including a strong theoretical understanding, developing the message design, selecting the best channel (Haug, 2004), using message theories and pre-testing them, sufficient exposure (Randolph and Viswanath, 2004), piloting and pre-evaluation (Noar, 2006), audience segmentation, and sensitive evaluation (Noar, 2011). Kreps & Neuhauser (2010) suggest special dimensions be considered in designing effective interventions, such as strengthening the theoretical foundation of health behaviour models, creating personal and contextual communication, and enhancing the interactivity of communication. WHO and the International Telecommunication Union (ITU) offered 'The National eHealth Strategy Toolkit' as a resource for the development of eHealth (WHO, 2012). In addition, CDC (2012) has developed guidelines to support the development, implementation, and evaluation of social media best practices.

### *2.13.1 Message Design*

Messages are the core of any health communication process. The design of messages cannot be isolated from other communication elements during the planning and design of the whole communication program. It is affected by all other components of the communication process and by other external variables and factors such as time, place, culture, frequency and language. Moreover, various characteristics and features play a role in a successful message (Airhihenbuwa & Obregon, 2000; Niederdeppe et al., 2008; Karjaluoto, Leppäniemi, & Salo 2004). Bernhardt (2006) indicated that message development is a core communication element of the social marketing model and includes creative message design, audience analysis and testing, revision, and dissemination. The message design in the communication process includes four elements: message content (what to say), message structure (how to put the message), message format (how to say it symbolically), and message source (who should say it) (Natu Pankaj, 2011).

There are many ways and approaches used for designing and developing messages for health communication. According to Maibach and Cotton (1995), they can be categorised into two main types: theory-driven approaches and audience-centred strategies. Theory-driven approaches include a decision-making approach, such as a staged social cognitive approach, fear appeal approach, using positive effect, and inoculation. They indicated that their application confirms that some of these approaches are more effective than others. Therefore, many research studies review classic communication theories by evaluating the practice in this field, and provide a foundation of the theoretical frames and scientific reference to inform and improve best practice. Strange and Leung (1999) stated that the studies linking narratives and message frames have provided evidence that the combination of various strategies and principles of message design can influence attributions of responsibility for social problems.

### *2.13.2 Agenda setting message design*

The Frameworks Institute (2002) tool and Niederdeppe et al. (2008) suggested strategies designed specifically for a public issue agenda. However, most of the theories and research in communication has focused on message design that targets individual attitudes, behaviour, and perceptions. Hence, it is not clear how these

theories can be applied to persuade policymakers and the public of the importance of health issues at a broader more societal level (Niederdeppe et al. 2008). Nevertheless, agenda setting messages are a special type of communication message. It is very important to consider the classic theories of message design when developing this type of message in order to build a strong scientific theoretical foundation for understanding and practice in this field. Furthermore, some of the individual targeted message design theories and approaches can be used directly in designing and crafting agenda setting messages, or at least in some stages of the design process.

McCombs (2004) indicated that the message content, including its tone, has an important role in shaping the agenda, by providing an in depth understanding of the images in people's minds and subsequent attitudes and opinions grounded in those images. The content of these types of message usually needs to be designed according to classic theories and approaches of message design. However, many researchers have discussed some essential components of message design that have an important impact in the agenda setting process. Brunner et al. (2011) discussed the importance of message design in creating public agendas, pointing out that the framing of messages is key to advancing public health agendas. They recommended moving away from individual responsibility and behaviour change approaches to frame a broader understanding of social factors that shape community health. Framing, according to Brunner et al. (2011. p 2), "provides the context that shapes how the message is understood and how the facts and science presented are interpreted". Dorfman, Wallack, and Woodruff (2005) discussed two types of frames that can be used in framing messages for shaping agendas: conceptual and news frames. They believe that these frames are the best strategies for the design of messages to shape agendas. In relation to conceptual frames, Lakoff et al. (2004) describe three levels for framing messages in the context of public health and other social or political issues. Level one is the expression of overarching values, the core values that enhance the change. Level two is the general issue being addressed. Level three is about the basic elements of those issues, including the policy detail or strategy. The conceptual frames explained by Dorfman, Wallack, and Woodruff (2005 p.5) are "people are only able to interpret words, images, actions, or text of any kind because their brains fit those texts into an existing conceptual system that



gives them order and meaning”. While conceptual frames are related to a person’s thought process, news frames are the source of information for creating these thoughts. According to Dorfman, Wallack, and Woodruff (2005) people in any community obtain their information about what they know about any issue, situation, or person from the media, especially the news.

### *2.13.3 Message design criteria and tools*

In developing and designing communication messages there are many features and criteria that can cause these messages to fail or to succeed (Public Health Ontario (PHO), 2012). As with any other health communication component, messages are affected by various factors. Niederdeppe et al. (2008) stated that many researchers explored the features and characteristics that enhance the effectiveness of messages. For instance, he mentioned credibility, likeability, similarity to the target audience, and physical attractiveness.

Aiming to provide a clear, concise, and measurable approach in the message design field, Mattson and Basu (2008) suggested a tool for message development. They emphasised the messaging process as an essential component in any communication process. Their tool focuses on the operational phases of message development within the whole process of communication, not on the design of the message itself. These phases include phase one to convene health issue experts to provide opinions and assessments of needs, while phase two convenes a working group to establish a strategic plan based on the messaging process. Phase three is about the implications of the strategic plan which includes specific message design. Phase four is the correction stage, where outcomes will help to evaluate and correct the campaign, and cycle that back through phases two or three. Public Health Ontario (PHO) (2012) developed a tool for health communication message review built on a list of criteria for it to be a persuasive message. (Appendix 2). The Frameworks Institute (2002) also developed a strategic frame analysis (SFA) approach based on suggestions gathered through their research. They suggested a check list of criteria to evaluate the communication messages of framing public issues (Appendix 2).

#### *2.13.4 Message design for new media*

The CDC has developed “The Health Communicator’s Social Media Toolkit” which is “designed to provide guidance and to share lessons learned in integrating social media (CDC, 2011 p.1). It includes many suggestions regarding specific popular channels and platforms. In addition, it clarifies the reasons for these suggestions and recommendations. Moreover, the CDC has published other guidelines that focus on writing for social media (CDC, 2012).

Testing and revision of messages is considered by many researchers as an essential tool in message development processes (Bernhardt, 2006; Mattson & Basu, 2008). For new media practices, messages must be designed taking into consideration the best strategy suited to variables and factors that affect the strength of the message. Pre-intervention and pilot testing are necessary to ensure that the messages selected and crafted achieve the communication objectives. This evaluation is based on the concept of formative research conducted with representatives from the target audience to examine the content before the real intervention (Lefebvre & Flora, 1988). In addition to investigating the suitability of using such content, this approach will improve the effectiveness and reach of this content (Kontos et al 2010; Lefebvre & Flora, 1988).

In the study context, the communication messages are the tweets as the study is using Twitter; the new media platform. Furthermore, since the study utilised the Diffusion of Innovations Theory (Rogers, 1962), it is central to the study that the tweets represent the innovations as defined by Rogers (1962 p.11) as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption”.

### **2.14 Twitter**

According to their official website (Twitter Help Centre, 2014), Twitter is “an information network made up of 140-character messages called Tweets.” It is a social and microblogging service that enables the sending and reading of media containing messages. It provides a “free, highly mobile, very personal, very quick” communication service (Grossman, 2009 p.1). It is a popular efficient, effective, and interactive communication platform for health promotion (Park et al. 2015;

Neiger et al. 2013; Funk, 2011). In addition to its simple and easy techniques of using, Twitter affords health promotion powerful ability to reach large size of audience within an instant timeframe (Park et al. 2015; Heldman et al. 2013). It enhances this capability by various types of activities available to all users. The main activities include: tweet, retweet, reply, and like. Moreover, it offers different types of content such as text, video, picture, and link. These variety of content types boost the communication activities (Park et al. 2015; Scott 2010). Supported by these activities and types of content, Twitter becomes a promising platform that fit well with the social media characteristics that emphasize the role of new media in people life in the evolving digital era (Park et al. 2015; Lovejoy & Saxton, 2012; Kelleher, 2007).

In addition to its power as a tool for health promotion, Twitter was chosen to be the new media platform in this study also because the statistics that show that Twitter is a potent new media platform Globally and in Saudi Arabia. The Saudi government already uses Twitter, for example, the Ministry of Health has an active Twitter account supporting the use of Twitter for this study.

Twitter, according to GWI (2015) is considered the third largest social network by active usage, and fourth network by account ownership. According to PewInternet.Org (2014), it has over 974 million registered accounts. In June 2015 there were 316 million monthly active users, posting on average 500 million tweets per day, supporting more than 35 languages (<https://about.twitter.com/company>). The 2015 statistics for Saudi Arabia show that amongst 18 million internet users (Internet world stats.com, 2015), 81 percent (Global Web Index, 2015a) have Twitter accounts. In addition, the country ranks number one globally in terms of visitation rates of non-registered internet users at 20 percent (Global Web Index, 2015a).

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The definitions of the most important terms regarding Twitter function and activities are adapted from Twitter's official website and are shown in Appendix 3.

#### *Twitter measuring tools*

The essential data about Twitter users are open by default and can be accessed directly from the service profiles. These include for example, a brief biography, tweets, followers, following, timing of activities, and data about interaction activities like replies and mentions. Furthermore, there are many third-party services providing a wide range of various statistics and analysis about Twitter users and their activities. Twitter provides access to application programming interfaces (API) which can be sold to provide simple or combined measures that provide much detailed data. For instance, some service providers focus on data about the influence of users, while others focus on tracking the tweets (Anger & Kittl, 2011; Boyd et al., 2010; Bakshy et al., 2011; Kwak et al., 2010; Zhao et al., 2011; Cha et al., 2010; Wu et al., 2011).

### **2.15 Road Traffic Accidents (RTA)**

Every year, RTAs result in 1.24 million deaths globally (WHO, 2013b) and this is estimated to increase to 2.3 million if no immediate action is taken (WHO, 2012; Grimm & Treibich, 2010). These accidents also cause 20 to 50 million injuries annually, including many permanent disabilities (WHO, 2013b). Among people aged 15 to 29 users, RTAs are the major cause of death, and they are ranked as the ninth leading cause of death overall (WHO, 2013b). The effects of RTAs have social, psychological and economic consequences. In Saudi Arabia RTAs are the major cause of death, injury, and disability among adult males between 16 and 36 years of age (WHO, 2013a). It is estimated that 81 percent of all deaths in Ministry of Health hospitals are due to RTAs with annual 39,000 injuries and 7,153 deaths (Ageli & Zaidan, 2013).

#### *Health Communication for Road Safety*

RTAs are largely preventable and in some cases may be predictable. Although many efforts were found to reduce RTAs, WHO (2004) indicated that the problem has received insufficient attention and is considered as a neglected major public

health challenge. Concerted efforts are required for effective prevention mechanisms (Peden et al., 2004). Health promotion has the potential to be applied in the prevention of RTAs. One such approach is health communication, including a wide range of media types and advocacy. Although there is controversy around its effect, mass media has significantly impacted road safety, especially when well-designed according to the principles of effective media combined with other activities, (Elliot, 1993; Delhomme, 1999; Delaney et al., 2004).

Most of RTAs communication targeting individuals to change their behaviours (Delaney et al., 2004). RTAs must be targeted by health communication as a public health issue and through a social consideration that go beyond behavioural change approaches (Raingruber, 2014; Bandura, 2004; Terris, 1968). It is confirmed that communication that aims to provide information and to change attitude will be more successful (Delaney et al., 2004; Wundersitz et al. 2010). Likewise, utilising Agenda Setting can afford more potential impact for road safety communication as indicated by many studies (Wundersitz et al. 2010; Elder et al. 2004). Furthermore, as indicated in the introduction, Agenda Setting communications can provide indirect high impact on behavioural change.

Rapidly evolving new technology has the potential to affect road safety positively or negatively (Lee, 2007). In addition to the information richness, one of the most effective advantages of social media is in providing an opportunity for more rapid reach and engagement. Furthermore, RTA statistics show that young people are the main victims of RTAs (WHO, 2015) which gives social media an important advantage, as it is most popular among this age group (Global Web Index, 2015b; Wundersitz & Hutchinson, 2011).

In practice, many health promotion organisations have used new media for road safety programmes (Murray & Lewis, 2011) with successful outcomes (Global Road Safety Partnership, 2012). Examples of organisations/campaigns that utilised new media include The Sussex Safer Roads Partnership (<http://www.sussexsaferroads.gov.uk>), The Transport Accident Commission (<https://www.tac.vic.gov.au>), Department of Transport and Main Roads (<http://www.tmr.qld.gov.au/>), Kenya Red Cross (<http://www.kenyaredcross.org/>), and the UN Road Safety Collaboration (<http://www.who.int/roadsafety>).

Evaluation reports from activities of The Sussex Safer Roads Partnership, the Transport Accident Commission, and Department of Transport and Main Roads showed effective and successful campaigns (Murray & Lewis, 2011).

Nevertheless, more evidence to support the use of new media for road safety campaigns is required. This includes more efforts toward the evaluation of such interventions. Murray and Lewis (2011). Powell, 2010), argue that evaluating health promotion projects using new media is a challenge. However, Powell (2010) indicates that the platforms of new media are an information rich environment, and this richness is not only in the content of these platforms, but can also be found in the data provided about their use which can be used for measurement and evaluation. In relation to social media and road safety, Murray and Lewis (2011) have suggested that future research and practice builds evidence- based resources for the function and impact of social media approaches. They noted that the components of a social media campaign are diverse and have various levels of success. It is crucial to support and develop the practice of using social media as a means of communication and information provision, sharing in the promotion of road safety (Murray & Lewis, 2011) through research.

## **2.16 Summary**

Health communication can provide the basis for understanding the communication process within new media platforms. However, clear theoretical and practical understandings of the use of such platforms for health are not available yet. The review covered many communication functions that can offer some insight into understanding and using new media for health promotion. This includes the impact of opinion leaders/influentials in the diffusion process, and the role of the diffusion itself in enhancing the communication of influence among new media users. These two functions can provide a promising start for determining best practices in utilising agenda setting for health promotion through new media platforms. The literature identified an obvious gap in this area which requires greater understanding and clear evidence -based guidelines. To establish this basis, more primary research efforts must be adopted by health promotion officials and organisations.

## **2.17 Research questions/ Study aim & objectives**

The purpose of the study is to provide a valuable contribution to the evidence base for best practice for health promotion in new media. The general aim of this study is to:

Explore the capacity of traditional communication theories, particularly agenda setting, in understanding the communication processes in the new media era and within new media platforms.

Under this main aim and within the specific context, the study has the following general objectives to:

- Examine the ability of new media data and tools in identifying influentials/opinion leaders for health promotion.
- Explore the capability of new media platforms, data, tools, and measures in informing health promotion research and practices.
- Explore the application of Diffusion of Innovation Theory in new media platforms related to health promotion activities.
- Investigate the use of the agenda setting function in the new media era and within its platforms.
- Examine the effectiveness of Twitter as a new media platform in influencing the health agenda.

Reviewing the literature and identifying the main gaps in knowledge of the topic suggests a three-stage structure as the basis of this exploration. These are influentials/opinion leaders' role, diffusion of influence, and agenda setting in the new media era. In addition to the general research question, the literature review identified, based on the three-stage structure theme, specific questions to be answered at each stage. These questions narrow the study objectives to match the study purpose and then guide its research processes. This guidance includes research design, methods, extracting findings, and lastly, discussing these findings (Creswell, 2005; Johnson & Christensen, 2004; Thompson et al. 2005).

**The general research question is:**

*RQ: How does Twitter influence agenda setting in public health/health promotion? (In the context of road traffic accidents in Saudi Arabia)*

Furthermore, the associated sub-questions are:

*RQ1-1: Who influences Saudis on Twitter?*

*RQ1-2: How are tweets disseminated among Twitter users?*

*RQ1-3: How does agenda setting work on the Twitter platform?*

Based on the three-stage structure that guided the study, Figure 2 illustrates the study objectives according to the research questions.

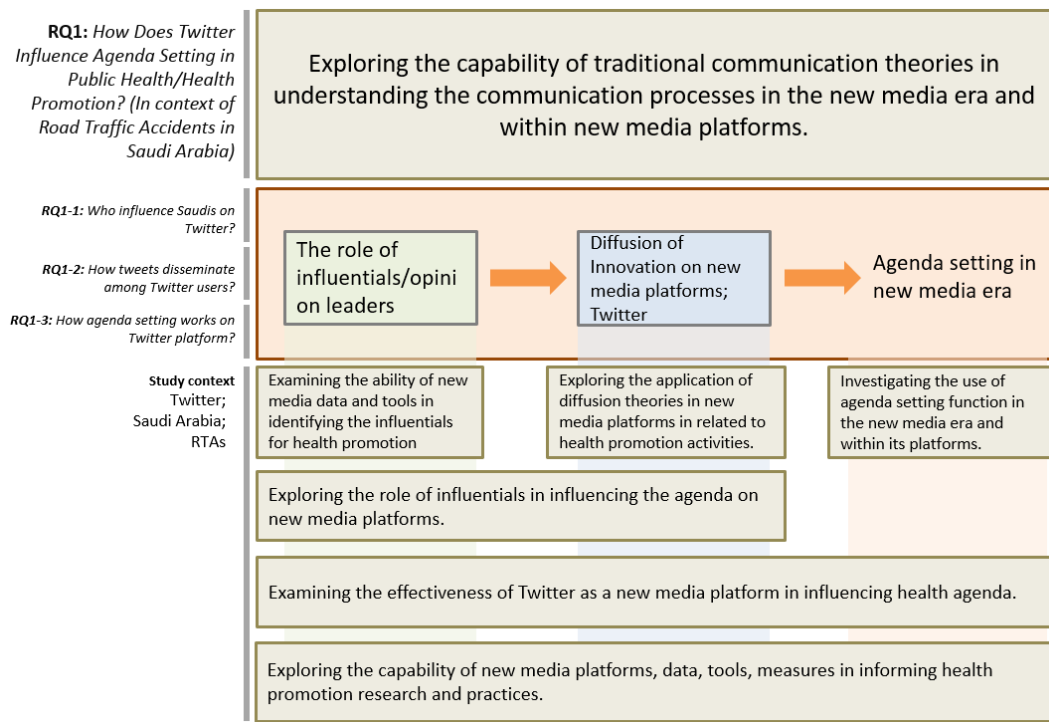


Figure 2: The research aim and objectives according to the three-stage structure.

Centred on the preceding literature review, the next chapter will describe the methods to achieve these objectives and answer the study questions.



## **Chapter 3: METHODS**

### **3.1 Introduction**

Following the three-stage structure (Figure 1), opinion leaders/influentials have a key role in both Agenda Setting and Diffusion of Innovations Theories. Thus, the resulting data from the Saudi Twitter influentials profile is essential to understand the interaction dynamics for both theories. Likewise, Diffusion of Innovations Theory (Rogers, 1962), was considered in the study to assess the dissemination and distribution of Twitter messages, a crucial component for the agenda setting process. The Agenda Setting Theory (McCombs & Shaw, 1972) is the core of the study to be investigated within the new media context using Twitter as an example. The study hypothesized that the function of Agenda Setting Theory still exists with an impact on people's lives in the new media era. The study attempted to explain how the agendas can be extended to other community segments through interactions between media, public, and policy agendas, or in other words, how new media can be successfully focused on specific health issues in public, media, and political agendas.

This chapter presents the study design employed and the rationale for its application. It describes the research design and clarifies the theoretical basis of choosing this design for the study. The chapter illustrates how a quasi-experimental approaches are implemented in the study. It also provides details about how the study design used an intervention including the use of a pilot study to evaluate this intervention. Next, the chapter explains the data collection and analysis procedures used. Reliability and validity issues related to the study as well as ethical considerations conclude the chapter.

### **3.2 Research Design**

Research questions play a key role in the design of research methods (Thompson et al. 2005) and the formulation of the questions must take into consideration the practicality of the design (Tukey, 1980). This research aims to assess the capacity of traditional communication theories in new media for health promotion practices in a real world context. This area lacks a solid foundation, demonstrating a need for

more research efforts to establish a theoretical and practical base, as indicated by the literature review (e.g. Valente, & Pumpuang, 2007; Wong et al., 2014; 2014; Roberts et al., 2002; Gurman et al., 2012; Im et al., 2011; Russell Neuman et al., 2014;).

Even the methods necessary for the research of new media are at a very early stage of development (Russell Neuman et al., 2014; Roberts et al., 2002; Gurman et al., 2012). This suggests the need for exploratory efforts from which to develop specific confirmatory research (Tukey, 1980). On these grounds, the study adopted an exploratory research approach to address the questions posed which was situated within a positivist frame of reference. Thus the study drew on experimental approaches, quantitative methods, and hypotheses testing techniques (Cohen & Crabtree, 2006).

The positivist paradigm complements the exploratory design of the study and this frame of reference offers many advantages. It is based on a theoretical belief which assumes the existence of a reality that is external and independent to people (Gray, 2013; Cohen & Crabtree, 2006). This reality can be accurately described through the use of suitable methods that must start from empirical inquiry based on scientific observations (Gray, 2013). Thus, it enhances the rigorous process of exploration by separating the reality from the researcher's claims and by outlining the research process (Cohen & Crabtree, 2006). The positivist paradigm offers the generalizability of methods capable of replication in different contexts (Johnson & Onwuegbuzie, 2004; Cohen & Crabtree, 2006).

The study design can be presented as nested in that the research frame is that of the positivist paradigm within which exploratory research is undertaken using a quasi-experimental approach through a comparative pre-test post-test design, all embedded within a real world context. Figure 4 illustrates the relationship between these types of research designs and methods in this study.

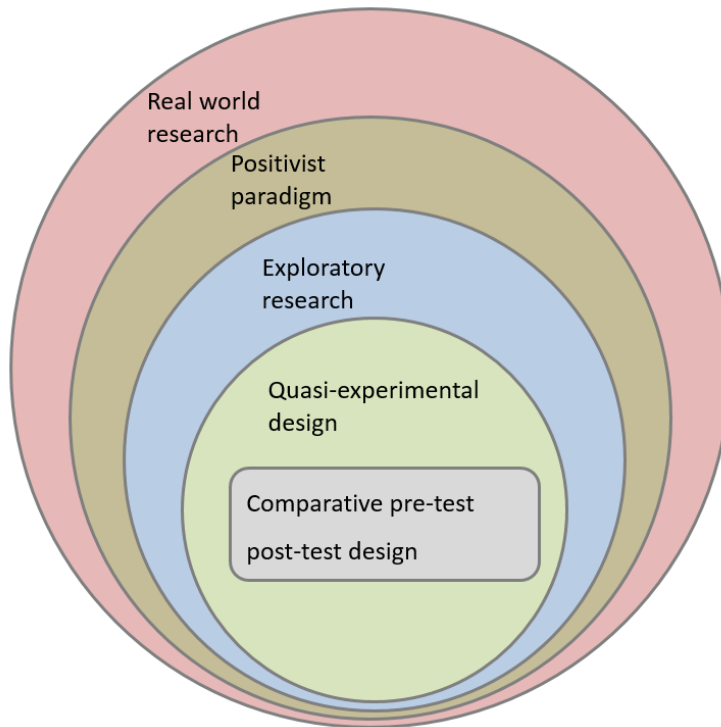


Figure 3: Research design employed by the study.

### *Quasi Experimental Approaches*

The quasi-experimental research approach is used in a situation where it is impossible to assign a group to conditions randomly (Shadish, 2001). This design helps researchers to provide causal interpretations based on “design features, practical logic, and statistical analysis to show that the presumed cause is likely to be responsible for the observed effect, and other causes are not” (Shadish, 2001 p.1).

The pre-test post-test design was employed to evaluate the impact of the interventions observed by the study. The study applied this design to two sets of Twitter data targeting two different groups. One was data of @SaudiMOH followers before and after the study intervention, and the other was the data of users who engaged in the related interactions before and after the communication. Furthermore, additional methods were used to examine essential data for the study aim and objective, which includes data of Saudi Twitter profiles, data of RTAs keywords mentions, data of tweets diffusion, and newspaper data.

### **3.3 Intervention**

The assessment of Agenda Setting and Diffusion of Innovations Theory is dependent on the quality of any intervention it is based on. This study intervention involved disseminating messages about road traffic accidents using the Saudi Arabian Ministry of Health (MOH) Twitter account (on Twitter (@SaudiMOH)). The account is a certified official account, and is influential among Saudi Twitter users, with more than 333,701 followers. The study used the account without changing its regular activity except to publish specific tweets within a specific time frame. Permission was granted by the Saudi MOH to use the Ministry account in this way and they reviewed and edited the final Tweets prior to dissemination. To design the intervention, various variables and components were defined according to the study objectives. These variables/components include duration of tweeting, timing, frequency and quantity, language, and content. The design of the intervention followed the measures of these variables for effective new media messages by exploring evidence from practice and literature. Therefore, the design of the intervention is, as far as possible, evidence based.

#### *3.3.1 Content*

The study intervention was developed by drawing heavily on the recommendations and guidelines indicated in the literature related to message design theories, writing for social media, and crafting agenda messages. First, it followed the conceptual frame to create its tweets considering the three levels of conceptual frame suggested by Lakoff (2004). Then, while designing the messages to fit with Twitter, the criteria of Public Health Ontario (PHO) (2012) and the Centres for Disease Control and Prevention (CDC) (2012) recommendations were applied. A tweet is limited to 140 characters; however, using 120 characters provides a better chance for followers to interact with the tweet without editing it if, for example, they want to add something (CDC, 2012).

The conceptual frames were explained by Dorfman, Wallack and Woodruff (2005, p.5): “People are only able to interpret words, images, actions, or text of any kind because their brains fit those texts into an existing conceptual system that gives them order and meaning”. Lakoff (2004) described three levels for framing messages in the context of public health and other social or political issues. Level

one is the expression of overarching values, the core values that enhance the change. Level two is the general issue being addressed. Level three is about the basic elements of those issues, including the policy detail or strategy. This was used to develop the Tweets. Table 3 provides examples of the initial Tweets developed for each of the three levels which were subsequently pilot tested through formative research with the target group.

	Level description	Examples (original tweets in Arabic language)	The translations of the tweets
Level 1	Expression of overarching values	الصحة الجيدة مصدر رئيسي للتطور و النماء الشخصي و الاقتصادي و الاجتماعي ، و هي مهمة لجودة الحياة عموماً. #يعطيك_خيرها #وزارة_الصحة	Good health is a major resource for social, economic and personal development and an important dimension of quality of life.
		كفردله قيمته في الحياة، يهتم الإسلام بالصحة ويفرض على المسلم التأكد من اتخاذ كافة الإجراءات الضرورية للحفاظ على صحته بصورة جيدة #يعطيك_خيرها	As an invaluable component for the life, Islam has many concept and values about health.
		الصحة حق أساسي من حقوق الإنسان و هي مكون رئيسي للتطور الاجتماعي و الاقتصادي. #يعطيك_خيرها #وزارة_الصحة	Health is a basic human right and is essential for social and economic development
Level 2	The general issues	هل تعلم ان في السعودية؟ يقتل شخص واحد كل ساعه بسبب الحوادث المرورية!!	Did you know that in Saudi Arabia about one person every hour is killed due to traffic accidents?!

		نسبة 81% من المتوفين في مستشفيات وزارة الصحة كانت وفياتهم بسبب حوادث المرور . #يعطيك_خيرها #وزارة_الصحة	81% of all deaths in Ministry of Health hospitals are due to RTAs.
		السعودية عام 2012 تسببت الحوادث بوفاة 6458 و فاة نتيجة 485,931 حادث مروري ، و سببت خسائر بحوالي 21 مليار ريال . #يعطيك_خيرها #وزارة_الصحة	There are more than 485,931 traffic accidents with 6,458 deaths in a year in Saudi Arabia.
Level 3	The basic elements of those issues	تعتبر البيانات الجيدة لتحديد مكونات المشكلة ثم تحليل هذه البيانات و تقييمها عنصر مهم في جهود منع حوادث المرور . #يعطيك_خيرها #وزارة_الصحة	The policy of road safety must build on a ground of analysis and interpretations of data.
		أي برنامج تدخل مجتمعي يجب أن يقترن ببرامج إعلامية مخطط لها بإتقان . #يعطيك_خيرها #وزارة_الصحة	Any community intervention programmes must be combined well-planned media and communication.
		حوادث المرور قضية صحية عامة يتولى مسؤولية الوقاية من أثارها الجهات الصحية بالإضافة لقطاعات اخرى كالأ حسب مهامه . #يعطيك_خيرها #وزارة_الصحة	Road safety is a public health issue which involving many sectors including health and others who have their responsibilities to be engaged in RTAs prevention.

Table 3: Examples of tweets for the conceptual frame levels.

### *3.3.2 Frequency and quantity*

The study intervention focused on influencing the agenda among available followers, so it focused on the quality, level and characteristics of dissemination and content of the tweets. Based on an analysis of the profile of the MOH Twitter account (@SaudiMOH) and its followers, the interventions were posted daily using three to five tweets (SocialBakers, 2013). Moreover, the study tried to keep constant the frequency of its tweets following the CDC guidelines (2012).

### *3.3.3 Language*

The @SaudiMOH account tweets in Arabic because it is targeted at and its followers are mostly Saudi Arabian people. While the Tweets could either be developed in English and translated into Arabic or developed in Arabic it was decided to write the Tweets in Arabic. The rationale for this is that the translation choice requires a translation stage, cross cultural verification, adaptation, and verification of psychometric properties of the Tweets (Rahman et al. 2003). To enhance their influence, tweets as a promotional message must utilise the richness of language through various narratives and metaphors which can be lost in translation (Van Nes et al. 2010). Cultural variables provide additional challenges for the effectiveness of translated messages (Van Nes et al. 2010; Rahman et al. 2003). However, the message evaluation checklist and message development tools suit all languages and can be applied without difficulty to Arabic messages. Therefore, the messages were developed in Arabic.

## **3.4 Pilot Study**

It is critical to apply pre-intervention and pilot tests to ensure that the selected messages are optimal for achieving campaign objectives. Many researchers consider testing and revision of messages one of the key processes of message development (Gurman et al. 2012; Mattson & Basu, 2008; Bernhardt, 2006). A questionnaire-based pre-intervention pilot study was conducted to evaluate the tweets designed for the intervention, and the tools used in collecting data. The developed tweets were published through a private account created on Twitter. The

tools of data collection were connected to the account. Ten participants were invited to follow the account, receive the tweets and answer the surveys (Appendix 5) adopted from the CDC guidelines (2012) and PHO criteria (2012). The data collected from the participants and the tools were analysed and results used to modify the intervention. Twenty-nine Tweets were developed in this way. Figure 5 shows the stages of the pilot study.

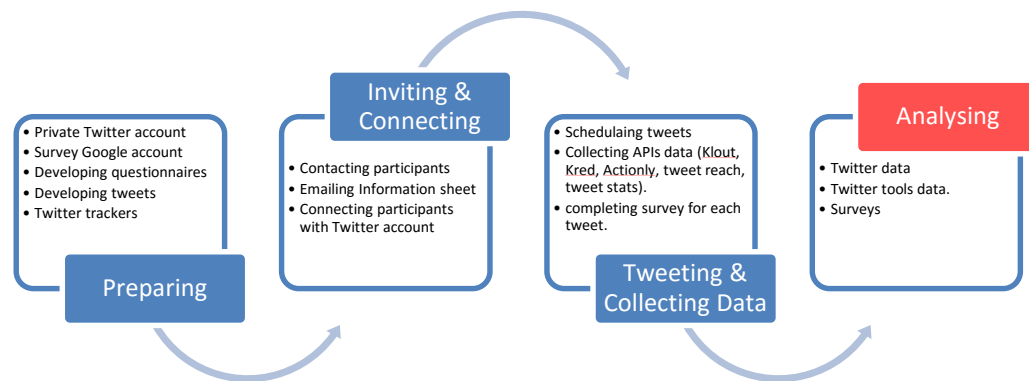


Figure 4: Pilot study procedure.

### 3.5 Sample

The intervention used the Ministry of Health account on Twitter, and the main sample comprises Twitter followers of the account. The number of followers of this Twitter account fluctuates. Prior to the intervention there were 333,701 followers, according to the account profile on Twitter. The full list of the followers including their details such as name, screen name, and number of followers was obtained from [birdsonganalytics.com](http://birdsonganalytics.com).

Receivers of the tweets have the ability to interact through various Twitter functions, and the message can be further disseminated. This means that it is not possible to predict the final sample size. Moreover, keyword mentions and campaign data are part of the study which are not limited to the account followers, but instead include a more extended list of users. However, the study data was limited to Twitter users from Saudi Arabia who interacted in Arabic.



## **3.6 Data Collection**

### *3.6.1 Introduction*

The data in the study are drawn mainly from Twitter, with a limited amount of extra data for newspaper mentions collected via Google advanced search service.

Twitter data were collected based on users, tweets, and time. User data comprised the profile of MOH account followers and the data that was required for identifying the Saudi Twitter influential profile, including, for example, the high ranking users based on the number of followers. Keywords in Arabic were identified for RTA the English translations of which are: traffic accidents, the traffic accidents, and road accidents. The tweets mentioning the keywords were identified and data of users who contributed to these tweets were also collected; this included for example; name, profile, number of followers, and type of contribution. In addition, the mentions of the same keywords were collected from six popular Saudi national newspapers.

All data related to the intervention tweets were tracked and collected, including for example tweet reach, who received and who interacted with the tweets. Due to the short period of time of the intervention, the data were extended to cover more tweets to support the validity of measures used in the analysis. These data were also used to evaluate the effectiveness of using traditional communication approaches to message design for Twitter, by comparing measures of the study tweets with other tweets.

Time was an essential variable in all data sets. In general, the data covered the period of three months from January 1, 2014 to March 31, 2014. The intervention was conducted between February 13, 2014 and February 19, 2014. The campaign was announced at the beginning of February 2014 so it overlapped the intervention on new media. The official TV programme started on February 24, 2014. This overlap affected the planned intervention by contributing to tweeting about the prevention of RTAs. However, the campaign simulated the normal factors that can affect the interaction dynamics among Twitter users. This reflects the nature of real world research, which is crucial in interpreting the resulting findings.

### 3.6.2 Twitter tools and Services

The content and data of Twitter are open by default and the essential data of Twitter users can be accessed directly from service profiles. Such profiles include brief biographies, tweets, names of followers, people the users are following, timing of activities, and data about interactions, such as replies and mentions.

Twitter data, statistics, and analyses can be gathered by many third-party licensed services. Twitter provides access to Application Programming Interfaces (API), which can be used by applications from many websites to provide simple or combined measures for many types of detailed data. Many previous studies have used the tools applied in this study to collect these two types of data. (These include: Anger & Kittl, 2011; Bakshy et al. 2011; Wu et al. 2011; Boyd, et al. 2010; Cha et al, 2010; Kwak, et al. 2010). The tools and services used in the study at different stages are illustrated in Table 4.

Time	Type of data	Examples of data types	Tracker/Source	Result
8/8/ 2014	Top Ranked Saudi users (primary lists)	Name; user name; profile bio; number of followers	Tweepar; SocialBakers; Twitter	182 users
11/8/ 2014	Scores of the top ranked Saudi users	Scores	Social Authority; PeerIndex; Kred; Klout	111 users
1/2/ 2014	MoH account followers list	Name; user name; profile bio; number of followers	Birdsonganaly tics.com; Twitter	333,701 followers
13/2/2014-19/2/2014	Intervention tweets	Total retweets; Life Span; Impressions; (accounts received tweet)	Tweetreach	1282 interactions
8/2/2014-12/2/2014	additional supported tweets	Total retweets; Life Span; Impressions; (accounts received tweet); contributors	Tweetreach	1605 interactions

1/1/2014- 31/3/2014	Tweets mentioned RTA keywords	Total retweets; Life Span; Impressions; (accounts received tweet); contributors	Tweetreach	54474 interactions; 38066 contributors
1/1/2014- 31/3/2014	Newspapers RTA keywords mentions	-	Google advance search	518 mentions
-	Groups/types classification	Male; female; religious; sport; media; individual; organisation	Manual	3664 users

Table 4: Data collection sources.

### 3.6.3 Classification

Classification of accounts into types, and users into groups, was central in the data collection and for data analysis. Since the researcher is familiar with the Saudi media environment, most accounts and users were classified straight way. Manual checking of profiles on Twitter was the method for the process. A validation process was undertaken through an invited external observer who independently used the classification process and inter-rater reliability was assessed. Figure 6 illustrates the procedural stages of data collection.

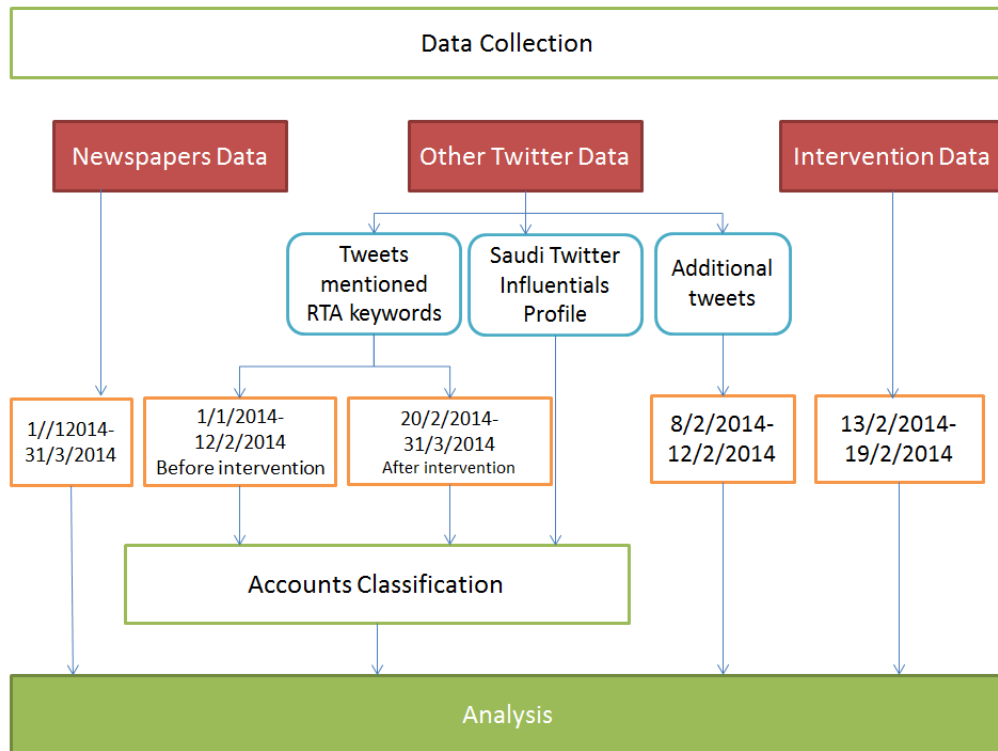


Figure 5: Data collection procedure.

### 3.7 Analysis

To analyse the study data, various quantitative statistical approaches were applied using different programmes. This included: quantitative descriptive research, correlational research, and causal-comparative research. In addition, statistical hypothesis tests were conducted for the hypotheses proposed by the study. Microsoft Excel 2013 was used to prepare, categorise, and filter the data sets. It was also used to apply many of the simple statistical processes, and IBM SPSS Statistics 21 programmes and R software were used to compute others. Table 5 shows the analysis approaches according to the targeted objectives.

Objectives	Analysis type	Measure/test	Programme
Identifying most influential group among Saudi Twitter users	quantitative descriptive methods	Simple ratio and percentage calculations	Microsoft Excel 2013
Exploring the diffusion of tweets according to	correlational statistics	Mann-Whitney U test	

Bass Model (Bass, 1969)			Microsoft Excel 2013; IBM SPSS Statistics 21
Examining the impact of influentials on the diffusing of tweets by retweeting			
Examining the impact of influentials on tweets life span.	correlational /causal comparative statistics	Pearson correlation	
Investigating agenda setting process within new media	quantitative descriptive methods	Simple percentages and averages calculations; simple rank scaling measure; network analysis,	Microsoft Excel 2013; IBM SPSS Statistics 21; R software
Explore the position of the new media agenda within classic Agenda Setting Theory		Plotted line graph	Microsoft Excel 2013

Table 5: Analysis procedure according to the study objectives.

Appendix (3) illustrates the main Twitter functions and main Twitter data variables that have been included in the data collection and analysis.

### 3.8 Reliability and Validity

Reliability and validity are two common measurements considered to evaluate the quality of evidence in research. Reliability focuses on the replicability or repeatability of the measurements which bring out the same results (Kirk and Miller, 1986). Validity verifies if the research accurately measures that which it was aimed to measure (Kirk and Miller, 1986). Cohen and Crabtree (2006) suggest three criteria to evaluate research within the positivist paradigm and these

are validity, reliability, and generalizability. This section considers reliability and validity in relation to the study design, data collection and analysis.

The study uses a quasi-experimental design. Quasi-experimental design lacks random assignment, which can increase the chance of bias and negatively affect study validity. The validity of quasi experimental research is not as high as that of true experimental research; however, for some studies, the quasi experimental design can be the most valid, which is the case in this study due to its exploratory nature. The application of a quasi-experimental design can provide the rationale for further research (Thompson & Panacek, 2006). However, quasi experimental design will not eliminate alternative interpretations of the findings.

At the level of data collection, many procedures were applied through the preparation and filtering stages to validate the results, for instance, using multiple sources and tools, exclusion of accounts without a score, checking of accounts on the official Twitter website, and conducting deviation means to enhance the strength of the filtration process. Tools and trackers for data collection offered a wide choice of operators with which to control the data targeted. This control enhanced the accuracy of data representativeness. In the classification stage, inter-rater reliability measures were applied using Kappa statistics (Cohen, 1960) and Fleiss et al. (1981) scaling to evaluate the strength of agreement.

Different types of triangulation were used to enhance validity through the various study stages. Triangulation is “a measurement technique often used by surveyors to locate an object in space by relying on two known points in order to “triangulate” on an unknown fixed point in that same space” (Mertens & Hesse-Biber, 2012 p. 1). The concept adopted as validating process of the research results (Mertens & Hesse-Biber, 2012). It is a technique based on using more than one method in a research study to strengthen the study design, and to enhance its ability to interpret the findings (Thurmond, 2001; Denzin, 1970).

Denzin (1970) proposed four types of triangulation in research: data triangulation, investigator triangulation, theoretical triangulation, and methodological triangulation. Data triangulation or data source triangulation is about collecting data through several approaches based on different variables (Denzin (Denzin, 1970; Thurmond, 2001). Investigator triangulation refers to the use of more than one

observer or researcher to interpret the same data (Denzin, 1970; Thurmond, 2001). Theoretical triangulation is the use of more than one theory or hypotheses in examining a phenomenon (Denzin, 1970; Thurmond, 2001). Methodological triangulation is the use of two or more methods when analysing data (Denzin, 1970).

Type of triangulation	Examples of use in the study
Data triangulation	As illustrated in table 4 and Figure 6, different types of Twitter data (e.g. users and tweets); different techniques used to collect the same data (e.g. two sources to obtain Twitter users lists).
Investigator triangulation	Inter-rater reliability was used for two different data by external two observers.
Theoretical triangulation	The study used more than one sub-hypothesis to validate one hypothesis (Appendix 1: article 2 & 3).
Methodological triangulation	Table 5 showed that the study utilised multiple statistical measures for one/more result/s and interpretation/s.

Table 6: Triangulation approaches used in this study.

Lastly, attention was paid to all methods and techniques designed and performed in the study to be replicable and applicable in relation to the study purpose in different contexts.

### 3.9 Ethics

The proposed research study was independently reviewed and approved by the National University of Ireland (NUI) Galway Research Ethics Committee on July 25, 2013. All ethical considerations in the designed intervention including the developed tweets, the study procedure, and participants' information sheet for the pilot study were reviewed and approved by the committee.

All relevant committees and authorities including, the Ministry of Health in Saudi Arabia, and the Saudi Cultural Bureau in Dublin were informed through official channels, and the required permissions were obtained. The Ministry of Health granted approval to use their Twitter account to publish the intervention tweets and to collect related data.

The contents and data of Twitter are publicly available as indicated in the Twitter Terms of Service (Twitter, 2015) which state “Most Content you submit, post, or display through the Twitter Services is public by default and will be able to be viewed by other users and through third party services and websites”. Furthermore, it is indicated in the Privacy Policy (2015) that “Any information that you or other users provide to Twitter is subject to our Privacy Policy, which governs our collection and use of your information.”

Twitter authorises the use of such information either by Twitter services or by application programming interfaces (API) which can be operated by third party services to provide various types of detailed data. The main tracker used in the study data collection was Tweetreach, which has licensed access to the data through Gnip, a Twitter company and official reseller. The study only used data available to the public and is legal to be collected in Saudi Arabia. Excluding the popular users involved in the Saudi Twitter influentials profiles, the data collected for this study was at population level, not individual level, and so data cannot be linked back to an individual.



## **Chapter 4: RESULTS**

### **5.1 Introduction**

The results of this study contribute to three peer-reviewed articles which have been accepted for publication in three different journals (Appendix 1 lists the final copy of these articles). In this chapter, the key findings from each article are highlighted and additional results generated from the main data set are presented. Using the pre/post research design, the data are explored in relation to the impact of the intervention and campaign, by comparing mentions of the keywords before the campaign and after.

### **5.2 Mentions of Keywords**

The campaign instigated by the Disabled Children's Association with backing from the Saudi ruling family in Saudi Arabia was announced at the beginning of February, 2014, and the intervention of this study ran from February 13, 2014 through February 19, 2014. Thus, it was expected that there would be an overlap in the impact of the intervention on the @SaudiMOH followers and other users. Consequently, it was difficult to isolate the effect of the intervention; however, the dynamics from the campaign, including the intervention, were informative in examining the influence of the RTA agenda among Twitter users. Furthermore, the intervention data were still important for investigating the diffusion of tweets, which is also central to this study.

The data revealed significant positive impact with an increase in mentions of the keywords from January to February and then March, 2014. Visually (Figure 5), the plotted graph of the 90 days of data showed growing trends over time. Although the intervention and campaign were during February, the rise continued into March. This was apparent in all measures, including reach, exposure, contributors, and different types of tweets:

- Reach is the “maximum number of unique Twitter accounts that received tweets” about keywords.

- Exposure is “the total number of times tweets were delivered to Twitter users timelines.
- Contributors include all users engaged in mentioning the keywords.
- Tweets can be regular tweets, retweets, or replies that mentioned keywords.

Figure 7 illustrates the timeline of these measures including time of campaign and intervention (Tweetreach, 2015).

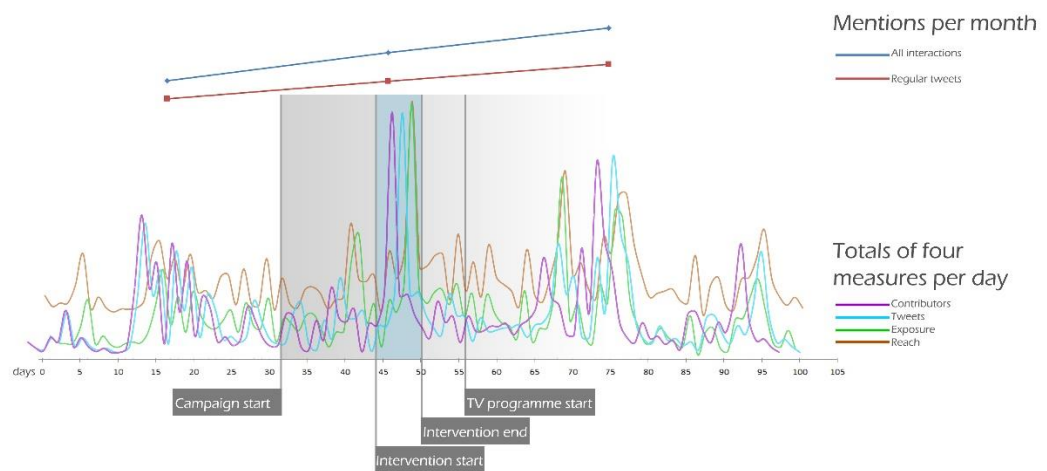


Figure 6: Totals of four measures according to campaign and intervention timeline.

Based on the cumulative percentage change, the regular tweets trend was higher as compared to the all interactions trend. This indicates that the increase in the level of personal adoption of the RTA issue is more than an increase in the level of supporting others adoption of the same issue, although both adoption types increased. Table 6 shows the data of regular tweets and all interactions over the three months, and Figure 8 shows the comparison between the trends of regular tweets and all interactions by illustrating the cumulative percentage change.

Tweets type	All Interactions	Regular tweets
January, 2014	15045	3160
February, 2014	18010	5010
March, 2014	20547	6771

Table 7: Data from two types of tweets that mentioned keywords for the three months.

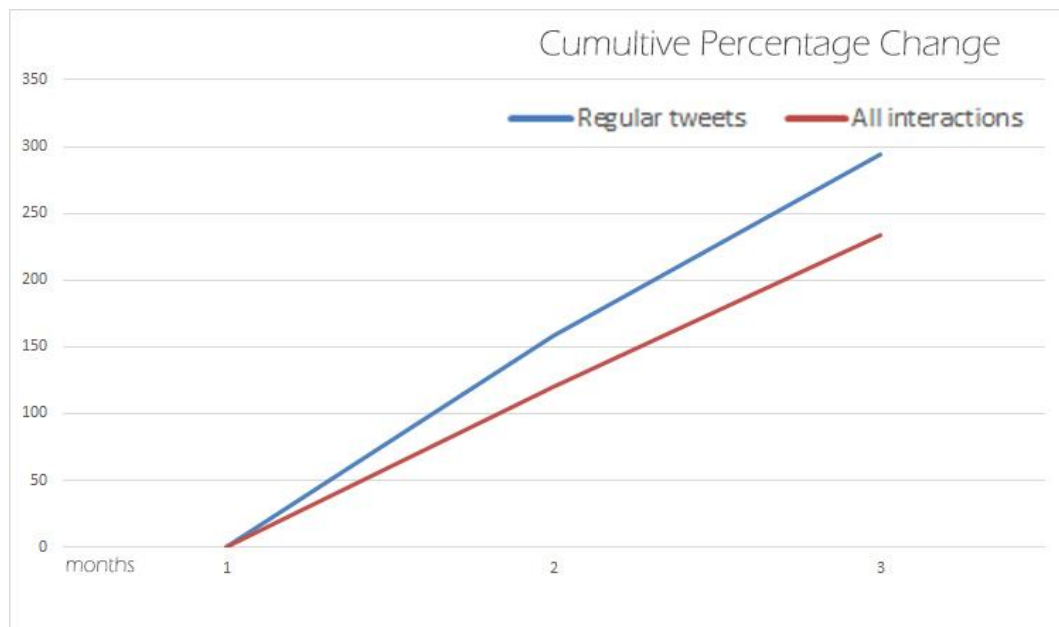
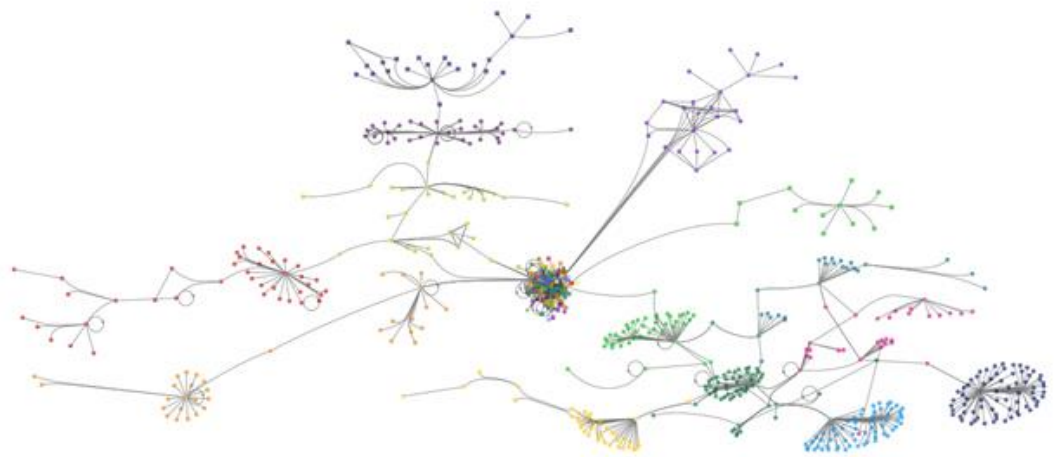


Figure 7: Data from two types of tweets that mentioned keywords for the three months.

It is clear that mentioning the keywords by users propagate the interactions among them due to the tweets' diffusion. This is indicated by samples of network graphs which illustrate, for all three keywords, a connected network with no obvious isolated groups. The dynamics of seven days of mentions of RTA keywords is shown in figure 9.



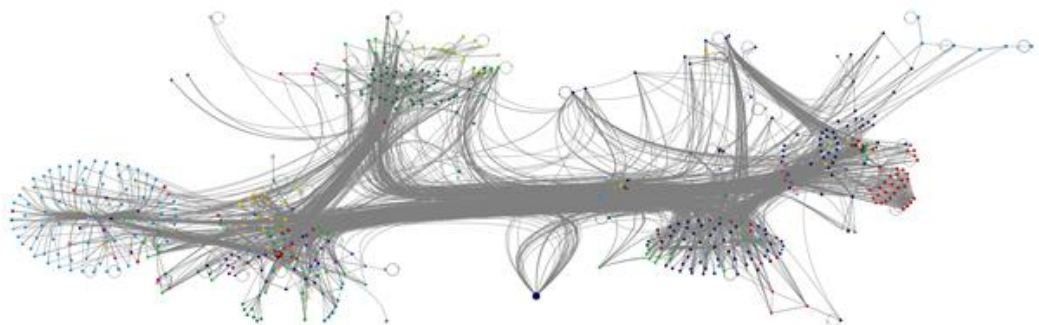
The Traffic Accidents

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Traffic Accidents

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Road Accidents

Figure 8: Network graphs of the three keywords Twitter mentions which show the dynamics of keyword (Arabic) mentions among Saudi twitter users.

## 5.3 Summary of the key findings from the three articles

### 5.3.1 Article 1: Twitter influencer profiles for health promotion in Saudi Arabia

Influentials play a key role in the dynamics of influence on new media platforms. For Twitter, exploring the influencers profile was essential in examining the function of theories targeted by the study. In addition, this profile will offer a reference for health promotion practices on the Twitter communication platform. Based on various measures and indicators (Appendix 4), the study provided a list of 99 Saudi users identified as the most influential users among Saudis on Twitter.

The study conducted statistical procedures to identify these influential accounts based on measures and indicators including: number of followers, and four influence scores (Klout, Kred, PeerIndex, & Social Authority). In addition, filtering and classification processes were utilised to extract the findings. The categorisation and classification of these influencers yielded important figures about the Saudi Twitter profile. The methods used in this study are highly replicable and can be used in different contexts.

The result reported in the paper show that Saudi users are highly influenced by users from the domains of: religion (25 accounts), media (16 accounts), sport (14 accounts), new media (10 accounts), and various other account types. Figure 10 shows the percentages of these domain types among Saudi user influencers.

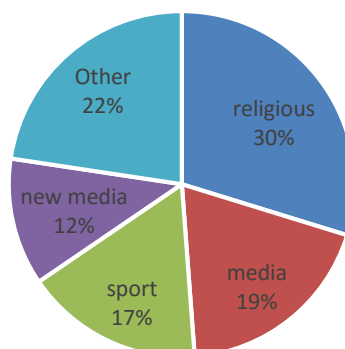


Figure 9: Percentages of the domains of the Saudi Twitter influencers.

Moreover, the list of the 99 users indicated that individuals (72 accounts) were more prominent compared to organisations (27 accounts), and among the individual accounts only four accounts were held by women.

### *5.3.2 Article 2: Investigating Diffusion of Innovations in Twitter*

The second paper focused on the diffusion of tweets among users using the Bass Model of Diffusion of Innovations Theory (Bass, 1969) as the investigating framework. The pattern of the dissemination of tweets is vital in understanding and exploring the communication dynamics of Twitter. Therefore, it is fundamental in setting the agenda which is the core of this study.

The Bass model (Bass, 1969) is built on the relationship between innovators and imitators within the diffusion process. The study did not intend to propose a mathematical application adopted from the model; instead, it used the model variables, mainly the concept of innovation/imitation, to find indicators that could be applicable in evaluating the tweets diffusion. A novel procedure was used to track 70 tweets provided in the data set, which were statistically analysed to identify informative indicators of successful, tweet diffusion. As hypothesised, the results suggest that innovation and imitation values were markers of successful diffusion. In addition, the analysis linked the innovation/imitation coefficients to prove the impact of influentials on the diffusion process by enhancing the retweeting, while no effect was found for influentials on the life span of the diffused tweets.

Beyond the data and analysis, the study explored how Diffusion of Innovations variables can be employed to understand, implement, and evaluate the communication dynamics of Twitter, which can inform more effective health promotion practices. By comparing the data of the intervention tweets and other tweets, the study investigated the capability of intervention and message design adopted from classic communication literature. The data showed no clear difference in retweets and lifespan between the two groups tweets. That suggests no clear signs of the compatibility. In general, the results presented by the paper suggest a promising field of research which have the potential to improve public health and health promotion practices on new media platforms.

### *5.3.3 Article 3: Investigating Agenda Setting Theory in New Media Era*

In this paper, various data were collected to examine Agenda Setting Theory in the new media age and within its communication interface. Two models were proposed: one for new media agenda setting and another adapted model for agenda setting in the new media era. Using Tweetreach services, the list of filtered and classified 1,115 users, who tweeted regular tweets and mentioned one of the three RTA keywords, were used to explore the account types that influence agenda. Retweet impressions, total impressions, and amplification multipliers were three measures used to explore the influence dynamics. According to Tweetreach, impressions is the “number of timelines that received the tweet directly from the user” and the amplification multiplier is the ‘rate of amplification, based on how far that contributor’s tweets spread due to the retweets and replies.’”

The gathered data support the dominance of individual accounts among organisational, policy, and media accounts with 76.3%, 67.8% and 96.2% of re-tweet impressions, total impressions and total amplification multipliers, respectively. It also showed that organisational accounts were more influential than media and policy accounts.

To differentiate the power of individual personal agendas from the public agenda, the averages of these three measures were analysed. Moreover, the contributor interactions supported this by logically assuming that any individual account targeted by another account must represent a personal account. In both analyses the data validated the personal agenda not the public agenda. The analysis of contributors’ interactions supports the previous findings in relation to the power of individual versus organisational accounts, and confirmed the bi-directional domination of both types.

The low values of two correlations confirmed that the influence examined in the study was the influence of agenda, not the influence of accounts. These were the correlation between number of deliveries, which is the number of times a tweet was received (Tweetreach, 2015), (0.08), re-tweet impressions, and the correlation between the impressions and amplification multiplier (-0.0061).

Lastly, to support the hypothesised model of agenda setting in the new media era, the data in relation to keywords mentioned on Twitter and the mention of the same

keywords in Saudi newspapers were visually compared by a plotted graph. The similarities identified in the graph support the proposed model that added the new media as a new agenda body within Agenda Setting Theory.



## **Chapter 5: DISCUSSION**

### **7.1 Introduction**

The findings resulting from the study provide convincing evidence that new media is a promising tool for health promotion research and practice. The study centred on the importance of comprehensively understanding the basis of best practice in health promotion through new media platforms. It presents the theoretical foundation that can aid in the design, implementation, and evaluation of such practices. It does so by providing a novel contribution to health promotion, specifically through the development of the use of an adapted agenda setting approach in the new media era and within its platforms. In this chapter, the findings of the study for all stages are discussed in relation to agenda setting, the third stage, of the research as identified in the introduction (figure 1). The findings relating to the first and second stages are embedded in this general frame to provide structure and coherence for the discussion.

The portrayal of a general understanding of new media as independent communication and as media of individuals will introduce the main topic of agenda setting. Agenda setting will be discussed as a function of communication within new media, and how it can be utilised for health promotion. The data on influentials and diffusion will be reviewed as two internal processes of agenda setting. Intervention design for health promotion in new media will be an additional discussion topic as it is covered by the study results. Recommendations for further research, implications and study limitations will be followed by a summary and conclusion.

### **7.2 New media: a promising tool for health promotion**

Supported by many features and characteristics, new media has become a potential tool for health promotion interventions (CDC, 2011; Eng, 2001; Korda, 2011; Neuhauser & Kreps 2003, Kreps & Neuhauser, 2010; Abrams, Schiavo, & Lefebvre, 2008). The data generated by this study confirms that Twitter in Saudi Arabia is an effective communication tool for health promotion. This is supported by the number of Saudis with access to new media platforms (Internet World Stats,

2015), and the number of active Twitter users (Global Web Index, 2015a). The data of the interaction dynamics collected by the study showed very active use of platforms among people in the country with a high susceptibility to influence others. The analysed data suggest that the impact resulted from population level influence, not through the influence of a few users. Yet; the data found that among Saudi influential Twitter profiles, there is a clear lack of reference to health, which may lead people to seek health information from unreliable sources.

The data mentioning keywords related to RTAs showed a high probability of success for such interventions demonstrated by the diffusion process. This indicates that most features that characterise the new media platforms can be effectively used to support health promotion programmes. Many internal and external factors must be considered when selecting the best new media platform for health promotion, according to the intervention circumstances. These variables include culture, language, availability, and popularity. Examining the statistics from the use of media platforms will help health promotion professionals and organisations to choose the most appropriate platform for their intervention. However, more specific exploration for health promotion efforts must be considered to contribute to more effective results.

### **7.3 Agenda setting for health promotion in the new media era**

The agenda setting function of communication (Dearing & Rogers, 1996) is a promising tool for health promotion and can influence health agendas, public health policies, and indirectly healthy behaviours (Atkin, & Rice, 2013; Kozel et al., 2006; Backer et al., 1992). Yet, examining this function requires a new research and practice foundation that matches the new media era (Wong et al., 2014; Best et al., 2014; Roberts et al., 2002; Gurman et al., 2012).

The trends in the data of mentioning keywords showed a significant effect in using Twitter as an agenda influence tool by understanding and applying the agenda setting function of communication. This will enhance the efficacy of health promotion programmes which adopt an agenda setting approach. Nevertheless, this use will require the implementation of evidence-based interventions that are designed based on a proper agenda setting framework. The study data showed that

agenda setting within new media can be successful in identifying and using influentials, and applying effective procedures to disseminate the influence within a framework of theoretical understanding.

### *7.3.1 New media is separate to traditional media*

The current study validated the view of Tran (2014) in that new media has many characteristics and features that separate it from traditional media. The power of an individual on the new media platforms is one of the features that clearly show the distinction between traditional media and new media. The domination of individuals among the Saudi Twitter influentials, and their impact on the diffusion process confirm this specific difference from traditional communication. In addition, the presence of new opinion leaders among the Saudi Twitter influentials, who were not influentials before, supports this distinction.

The agenda setting function explored in Twitter exhibits a clear context that differs from the classic agenda setting model. The data confirmed the domination of individual agendas and added to the low dominance of the two main components in the classic agenda setting model, which are media and policy agendas. New media opens communication to other organisations to contribute in setting the agenda with media and policy organisations. It also altered the power balance of the setting function towards the individual and public as targets, and as a source of influence.

A general inspection of the data of both keywords trends in Twitter and in newspapers aligned with new media suggests new media as a separate body in agenda setting, although this requires further validation. It is important for health promotion to deal with new media based on this concept, considering that the programmes designed for traditional media do not necessarily fit with new media. Moreover, the theoretical basis informed by the traditional media literature requires updating to validate their suitability for new media.

### *7.3.2 Mass communication and interpersonal communication in new media*

One of the most obvious differences between traditional media and new media is the disparity in the communication audience-based processes. The findings from the study identified many places where interpersonal and mass communication

merged with no clear boundaries. New media offers a transition from the level of interpersonal communication to the level of mass communication through the same content, channels, and processes. For example, any interpersonal communication between two users on Twitter can be simultaneously mass communication in specific circumstances. Actually any activity on Twitter that targets individuals and a mass audience at the same time with the same content and through the same channel is mass communication according to its simple definition “large-scale distribution and reception of content” (McQuail (2010 p. 58). The data collected on interactions in this study show how a single interaction between two users can be propagated to become a mass trend among a huge number of users. Although the influentials play a potent role in this context, the data confirmed that this feature is not limited to the influential accounts, as it can happen from and through ordinary users.

This new communication phenomenon must be considered when new media platforms are used to channel programmes (Morris & Ogan, 1996). This affects how such programmes can be developed, implemented, and evaluated. Nevertheless, this impact highlights the limitations of traditional communication theories in understanding new media (Morris & Ogan, 1996; Poole & Jackson, 1993). In summary, the powerful features of new media compel a review of traditional understandings of these two communication types. In the same manner and via different routes, the blurring of boundaries between interpersonal and mass communication emphasises the powerful role of the individual within the new media platforms, which will be outlined in the next section.

### *7.3.3 New media is the media of the individual*

One of the most potent features of new media is enabling the individual to be an active player in communication processes (Cha et al. 2007). The feature of user generated content is an essential component of new media (Cha et al. 2007; Vickery & Wunsch-Vincent, 2007; Dellarocas, 2006). It provides individuals with a wide range of opportunities to contribute in the communication process. The content is not limited to tangible objects like text, picture, or video but can incorporate intangible aspects such as opinion or influence.

In general, the individual's contribution has various implications on communities and people's lives (Vickery, & Wunsch-Vincent, 2007; Dellarocas, 2006). One of these implications is the ability to participate in the agenda setting function within new media, and as a result potentially in the agenda setting of any society. This is at the level of influencing others, as well as targeting others to be influenced. This agenda setting is supported by the study results, including data of Saudi Twitter influentials, tweets diffusion data, agenda setting dynamics, and data of keywords mentions. The data of Saudi influential profiles revealed that most of the influential accounts are individual accounts. The examination of the data of the tweets diffusion process showed that individuals have a great impact in enhancing the diffusion process. In addition, the data of agenda setting dynamics significantly found that individuals do not need specific characteristics to contribute to agenda setting, confirming the power of individual's accounts in agenda setting.

In the new media, individuals must be considered as independent actors. They have a potential role in triggering influence and disseminating it. In addition, the personal agenda of individuals becomes much more explicit, which also enhances the influence of the individual agenda. For health promotion, these new understandings must be considered and implemented in the design of interventions. New media allows people to be reached, not only by public communication approaches, but also by approaches that target individuals directly. Furthermore, the individual agenda and their power to influence communication dynamics appears to suggest that targeting the individual to influence the agenda should be the first choice for health promotion projects and programmes using new media. Likewise, directly reaching individuals via new media enables health promotion professionals to access more accurate data about community and people without distortion. This is an important feature for health promotion best practice, either by improving the evaluation and design, or by enhancing more accurate research.

#### *7.3.4 Agenda setting inside new media*

The study showed that the components of agenda setting in new media differ from the classic agenda setting models. As indicated by previous studies (Tran, 2014; Bekkers et al., 2011; Sayre et al., 2010), the nature of new media changed the process of agenda setting as it gives people the power to control what they want to

think about (Chaffee and Metzger 2001). As suggested in this study, it empowered individuals' agendas and gave organisations a chance to participate in setting the agenda. In summary, agenda setting is a promising framework for health promotion practices inside new media; however, a new level of understanding in light of these considerations must be accomplished.

#### **7.4 New media influentials for setting the health agenda**

By addressing the research sub-question *who influences Saudis on Twitter?* the study emphasised the importance of understanding the theoretical basis of the impact of influentials and opinion leaders on new media platforms. Particularly, for health promotion, understanding the theoretical frameworks relevant to using influentials in the domain of health will improve the outcomes of such practices.

This exploratory research examined multiple indicators to provide informative techniques that can be applied to measure the ability of users to influence the domain of health through new media. Evaluation of the procedures to identify and classify influentials is essential for providing replicable methods for further exploratory or confirmatory research. Identifying these influentials and classifying them according to different variables, including culture and interest, will enhance their use in health promotion interventions. Moreover, understanding their characteristics and the reasons behind their influence will also provide important information on the community agenda.

The data generated from the process of classifying influentials indicated the importance of culture. This is demonstrated in this study by the weak presence of women and strong domination of religious men, an obvious reflection of Saudi society. This is important for health promotion, whether in the improvement of the intervention performance or programme design.

The capability of using measurement tools and trackers to identify influentials was tested in this research study. Some of the results from the data of Saudi Twitter influentials are in agreement with the findings suggested by previous studies on the opinion leaders of the Saudi community, including for example, the influence of Islam as a religion for Saudi people (Prokop, 2003; Alam, 2007). These analogous findings suggest the capability of using measures and procedures that have been

applied for identifying the influentials among new media users. The data provided clear methods to identify the influentials based on consecutive stages of analysis using various parameters and indicators.

The examination of the diffusion process of tweets found that influentials played an important role in enhancing the diffusion process. The influentials engaged in the dynamics of diffusion according to the central role of imitation in the adoption process, as explained by the Diffusion of Innovations Bass model (Bass, 1969). The data also illustrated the benefits of identifying influentials in measuring successful diffusion. On the other hand, while the data about influentials confirmed their role in the influence dynamic, it also revealed a lack of use of this concept for public health and health promotion in Saudi Arabia. The data of influentials showed only one health related account among the organisational accounts. This indicates more effort is needed in this regard for health promotion in new media.

## **7.5 Diffusion for agenda setting in new media**

Reviewing the literature of agenda setting confirmed the central function of diffusion in the agenda setting process (Vu, & Gehrau, 2010; Walker, 1977; Singhal, & Quinlan, 2006; Hays, & Glick, 1997; Rogers, 1962). Likewise, diffusion of the agenda and enhancement of the related influence is the core process of setting the agenda within new media and by new media through community processes. In this context, social interactions play a key role in framing the relationship between the diffusion process and the agenda setting function of new media platforms.

Understanding the diffusion according to new media variables and factors is essential in using this process for agenda setting interventions in health promotion practices. Therefore, how Tweets are disseminated among Twitter users is important to consider. The study validated the important position of diffusion within agenda setting through a number of results. Firstly, as the influentials/opinion leaders' function is based on disseminating the influence, information, or opinions to others, examining the function of influentials/opinion leaders' indicated an implicit role in diffusion. Secondly, investigating the internal process of diffusion of tweets found informative indicators and parameters that matched the theoretical basis of Diffusion of Innovations models. Thirdly, the

exploratory data of agenda setting exhibited strong social interaction dynamics. Finally, the keywords data illustrated well connected networks that reflect the social interaction of users who contributed in mentioning these keywords. These findings clearly indicate the vital function of diffusion in disseminating the influence among Twitter users. In addition, the trends data of keywords mentioned showed a difference in the increasing rate between tweeting original tweets and retweeting others' tweets; such as increasing personal adoption more than imitating others. This suggests that diffusion of influence can work perfectly in setting a personal agenda, which can lead to influencing the public agenda and other agenda setting components.

Moreover, modelling the diffusion and Diffusion of Innovations Theory gave a basis to the study for exploring the ability of such literature (Rand et al. 2015) to provide a constructive understanding of the diffusion of tweets. For this, the study identified several quantitative methods for examining the diffusion process, and testing different parameters extracted from previous diffusion modelling efforts. It proved the usability of the Diffusion of Innovations Theory in understanding the communication processes within new media. It also demonstrated the applicability of diffusion models in understanding and using new media channels.

The adoption variables from the Diffusion of Innovations Theory (Rogers, 1962) provided a solid explanatory framework for how the tweets cascade according to the type of users participating in the communication. Furthermore, indexes from the Bass model (Bass, 1969), including imitation and innovation, were used to provide informative measures for the diffusion process on Twitter.

Although the theoretical bases of traditional communication can provide a useful start, more advanced constructs will be required to fit the new media era. The investigation of these and testing of their capacity with new media variables will provide valuable insights into the use of new media in health promotion.

## **7.6 Designing health promotion interventions for new media**

Similar to any practice in other domains, employing agenda setting for health promotion in new media must be constructed within an evidence-based framework. This includes using influentials, enhancing influence diffusion, and improving the



dynamics of agenda setting. Many factors that affect these dimensions have been altered by the characteristics and nature of new media.

The study evaluated the design and implementation of health promotion interventions for new media based on the traditional literature on message design. The data analysed by the study showed that the traditional literature on intervention design did not provide better outcomes when compared with other interventions. While this literature can inform the basic concepts for this purpose, it lacks the efficiency in achieving the objectives of such interventions. Starting from assessing the capacity of the traditional theoretical base, it is necessary to review the literature of best practice guidelines for health promotion research, including design, implementation, and evaluation. Moreover, health promotion in general may need to be reviewed according to the digital era because new media has become an essential element in people's lives. By considering big data provided by new media, high quality research to analyse and interpret the data of new media can offer well framed guidelines for intervention design.

### **7.7 Implications for research, practice, and policy**

The current study addressed the application of the agenda setting function of communication for health promotion in the new media era. It examined the capacity and impact of this function within the sphere of new media. Through exploratory research, the study examined innovative approaches, and applied many adapted methods to analyse the collected data.

Potential research areas to be explored include:

- Best practices for using influentials in new media for health promotion. Although the study confirmed the positive role of influentials and provided compatible methods to identify them, how these influentials can enhance health promotion practices is still to be determined.
- Validating the methods and quantitative procedures that have been applied by the study will require replication and re-application for different health topics in different circumstances. This will add valuable information in testing such methods, modifying them, or providing alternatives to them.

- Examining the causality between these variables can be a powerful informative area of research. In particular, investigating causality will improve the utilisation of the agenda setting function.
- Development of more interventions based on traditional models and establishing a new scientific theoretical basis is required. This will support the assessment of the best guidelines for the use of traditional literature and providing new appropriate references for health promotion practices using new media.

Furthermore, considering the limitations of this study indicates the need of further research to extend the validity of the study findings. This could include, for example, conducting studies for a longer period of time, on more than one topic, through different platforms, or using larger sample sizes. The next section will trace some of these limitations.

In addition to the research implications, the findings presented by the study have many implications for informing the design, implementation, and evaluation of health promotion practice. The study put emphasis on using new media for influencing the agenda of public health and health promotion concerns. Indeed, examples of these practices included awareness campaigns for specific public health issues, such as road safety. The large scale of interaction results from the intervention and campaign strongly indicate a high level of success for such health promotion practices. Besides setting the agenda, other uses may include epidemiological studies, behavioural interventions, evaluation of interventions and programmes, and social marketing programmes, among others.

From a different angle, it may influence the research agenda to be adopted by policy makers at the level of organisations and government sectors. Yet, the general finding of the study is that many efforts toward establishing new frameworks and theoretical bases must be conducted to inform health promotion research and practice on new media platforms.

## **7.8 Limitations**

New media provides open communication platforms for all people to generate content and participate in its interactions. Yet, because of the digital nature there is controversy regarding the validity of the data generated by these platforms. For example, it is possible for such data to be due to fake users, spam interactions, or automated responses that can affect the interpretations of yielded data. Although these platforms developed advanced techniques to filter such acts (Thomas et al., 2013), the possibility of creating similar activities that bias results exist. In sum, the findings yielded by the study can be generalised for newest media platforms; however, more specific research on other platforms is required to validate such findings.

Using the Saudi Ministry of Health account restricted full control of the intervention, leading to some of the guideline instructions being missed while conducting the intervention. In addition, the time factor is a clear limitation in the study as the agenda setting function is highly affected by time. Moreover, time is one of the variables most affected by the nature of new media.

Finally, considering the availability of vast amounts of data and convenient automated analysis, the study could have collected and analysed more data, which would have increased the validity and avoided many of the limiting factors.

## **7.9 Conclusion**

This study is theory-based exploratory quantitative research. This type of research always encourages researchers to remember that novelty is a crucial goal of scientific research (McMillan, 2000). Through the three-stage structure, the study provides an innovative contribution to health promotion practice and research by examining the agenda setting function of communication in the new media era. Although it is an exploratory study it shows promise for the promotion of the public health. The results from the study found a promising capacity of agenda setting function on new media platforms. This upstream approach to health promotion focuses on social change which is a promising strategy for new media that possesses high level of interactions between people as shown through the study results.

The study provided a critical awareness of the role of traditional media theory for new media. In addition to the main aim of the investigation, the results presented a practical review of the capacity of traditional literature in relation to the message and intervention design for new media. The findings also confirmed the view that new media melds interpersonal and mass media communication (McQuail, 2010; Morris & Ogan, 1996; Poole & Jackson, 1993). Moreover, gathering data from new media is usually through various types of tools programmed and integrated within the platform processes. Developing capacity in the use of these tools in health promotion research and practice is crucial and must be built on a solid foundation. Evaluation of the use of these tools was one of the study objectives, and their effectiveness was demonstrated. As indicated in the review of literature (Powell, 2010; Evers, 2006) this effectiveness is not only on the level of data collection, but also in the analysis of the findings, and informing the development and evaluation of interventions.

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## APPENDICES

### **Appendix 1: The three journal articles**

*Article 1: Identifying Twitter influencer profiles for health promotion in Saudi Arabia.*

Albalawi, Y., & Sixsmith, J. Health Promotion Journal, Published on 29/10/2015.

<http://heapro.oxfordjournals.org/content/early/2015/10/28/heapro.dav103.abstract>



*Article 2: Exploring the Diffusion of Tweets Designed to Raise the Road Safety Agenda in Saudi Arabia.*

Albalawi, Y., & Sixsmith, J. Global Health Promotion Journal, Accepted on 26/10/2015

*Article 3: Agenda Setting for Health Promotion: Exploring an Adapted Model for the Social Media Era.*

Albalawi, Y., & Sixsmith, J. JMIR Public Health and Surveillance, Published on 25/11/2015

<http://publichealth.jmir.org/2015/2/e21/>

## Appendix 2: Message design criteria and tools

*Public Health Ontario (PHO)*



### Health communication message review criteria

		Great	Good	Fair	Fail
<b>1</b>	The message will get and maintain the attention of the audience.				
<b>2</b>	The strongest points are given at the beginning of the message.				
<b>3</b>	The message is clear (i.e., it should be easy for the audience to point out the actions you are asking them to take (Now what), the incentives or reasons for taking those actions (So what) as well as the evidence for the incentives and any background information or definitions (What)).				
<b>4</b>	The action you are asking the audience to take is reasonably easy.				
<b>5</b>	The message uses incentives effectively (more than one type of incentive is used, the audience cares about the incentives presented and the audience thinks the incentives are serious and likely).				
<b>6</b>	Good evidence for threats and benefits is provided.				
<b>7</b>	The messenger is seen as a credible source of information.				
<b>8</b>	Messages are believable.				
<b>9</b>	The message uses an appropriate tone for the audience (for example, funny, cheery, serious, dramatic).				
<b>10</b>	The message uses an appeal that is appropriate for the audience (i.e., rational or emotional). If fear appeals are used, the audience is provided with an easy solution.				
<b>11</b>	The message will not harm or be offensive to people who see it. This includes avoiding 'victim blaming'.				
<b>12</b>	Identity is displayed throughout.				

Final recommendation

Use  Lose  Adapt

### *The Frameworks Institute*

- Based solely on the material you have provided, are you confident that an ordinary reader/viewer could answer the critical question: What is this about? Is it about prevention, safety, freedom, etc.?
- In your attempt to frame for the reader “what is this about,” did you begin at Level One, by introducing a value like responsibility, stewardship, or fairness?
- Did you reinforce your Level One message by using words, images, metaphors that support your frames?
- Did you signal early in your message that solutions exist? Do the solutions “fit” the problem as defined?
- Did you emphasize efficacy and prevention in the solution? Did you inspire optimism and give evidence that the situation can be improved?
- Did you establish the cause of the problem, and did you assign responsibility? Reviewing your material, can you tell who created the problem and who should fix it?
- Does your story have sufficient urgency to place it on the public agenda? Have you asked and answered the question: “What will happen if we do nothing”?
- Did you effectively put the problem in context, explaining long-term consequences, trends and opportunities to resolve the problem, so that your story is not episodic?
- Did you stay reasonable in tone, avoiding rhetorical or inflammatory partisan attacks as appropriate?
- Do your visuals make the same points that your words make? Are they organized to support a coherent story?
- Did you use numbers sparingly? Did you first tell what they mean? Did you translate them into social math?
- Did you anticipate and deflect the default frame? Did you avoid arguing with it directly and, instead, substitute a new frame?

- Did you use credible and unlikely messengers? Are they likely to be perceived as overly vested in the issue or a sole solution?
- Is your message strategically oriented to the intended audience, i.e. if addressing business leaders, did you frame your issue as appealing to managerial competence and responsibility?
- Did you tell people explicitly how they can help, how they can stay engaged, where they can get information, how they should continue to think about these issues, what they should watch for to monitor progress, whom to hold accountable for what actions? And when you did so, did you address them in their role as citizens or merely as consumers?
- Did you use all elements of the frame to set up your reframe? Context, values, visuals, models and metaphors, numbers/social math, tone?

### Appendix 3: Twitter function and activities

<https://support.twitter.com/articles/166337>

Twitter	An information network made up of 140-character messages from all over the world.
#	The # symbol is used to mark keywords or topics in a Tweet.
@	The @ sign is used to call out usernames in Tweets, like this: Hello @Twitter! When a username is preceded by the @ sign, it becomes a link to a Twitter profile. See also Replies and Mentions.
API	An Application Programming Interface. Contains all Twitter data and is used to build applications that access Twitter much like our website does.
Bio	A short personal description of 160 characters or fewer used to define who you are on Twitter
Mention	Mentioning another user in your Tweet by including the @ sign followed directly by their username is called a "mention". Also refers to Tweets in which your username was included

Profile	A Twitter page displaying information about a user, as well as all the Tweets they have posted from their account
Retweet (verb)	To retweet, retweeting, retweeted. The act of forwarding another user's Tweet to all of your followers.
Retweet (noun)	A Tweet by another user, forwarded to you by someone you follow. Often used to spread news or share valuable findings on Twitter
Follower	A follower is another Twitter user who has followed you.
Follow	To follow someone on Twitter is to subscribe to their Tweets or updates on the site.
Following	Your following number reflects the quantity of other Twitter users you have chosen to follow on the site.
Timeline	A real-time list of Tweets on Twitter. See also Home Timeline.
Trending Topic	A subject algorithmically determined to be one of the most popular on Twitter at the moment.

#### **Appendix 4: Twitter data variables (TweetReach metrics)**

<http://help.tweetreach.com/hc/en-us/articles/201201556-Understanding-the-TweetReach-snapshot-report>

Terminology	Definition
re-tweets	Number of times a message was re-tweeted

Deliveries	This is the initial number of accounts to which a tweet is delivered. This is equivalent to the follower count of this account at the time of sending this tweet.
Total_Impressions	The total number of impressions earned, including impressions from re-tweets and replies
Re-tweet_Impressions	The number of impressions re-tweets of this tweet have generated.
Amplification_Multiplier	How far that contributor's tweets spread due to the impressions generated by re-tweets and replies. This is defined as $((\text{total exposure} - \text{impressions}) / \text{impressions}) + 1$

## Appendix 5: Pilot study surveys

	Questions for each tweet	Arabic translation
1	The message will get the attention of the audience.	التغريدة ستلفت انتباه القراء
2	The message will keep/maintain the attention of the audience.	التغريدة ستحافظ على مستوى الانتباه الموجود
3	The strongest points are given at the beginning of the message.	قوة جذب التغريدة في بدايتها

4	The message is clear.	التغريدة واضحة
5	The Message is believable.	التغريدة قابلة للتصديق
6	The message uses an appropriate tone for the audience.	أسلوب التغريدة ولهجتها مناسبة للقراء
7	The message uses an appeal that is appropriate for the audience.	أسلوب استدعاء الانتباه الموجود في التغريدة مناسب للقراء
8	The message will not be offensive to people who see it.	التغريدة لن تزعج أو تضايق من يقرأها
9	The message will not harm the people who see it. This includes avoiding 'victim blaming'.	التغريدة لن تسبب أي ضرر لمن يقرأها ولا تشمل أي أسلوب به لوم للضحية وهو لومه لخطئه وتخويله به
<b>General questions</b>		
1	The action you are asking the audience to take is reasonably easy.	التغريدات بالعموم تطلب من المتابعين أشياء سهلة وممكنة
2	The message uses incentives effectively (more than one type of incentive is used, the audience cares about the incentives presented and the audience thinks the incentives are serious and likely).	قدمت التغريدات عناصر جذب في مضمونها لدعم اهتمام المتابعين:
3	Good evidence for threats and benefits is provided.	قدمت التغريدات أدلة كافية على المعلومات المذكورة:
4	The messenger is seen as a credible source of information.	حساب وزارة الصحة على تويتر يعتبر مصدر موثوق لمثل هذه المعلومات
5	Identity is displayed throughout.	اتصفت كل التغريدات بنفس هوية الصياغة والمضمون:
6	Duration: tweeting was for 14 days.	مدة التغريد المرتبطة بموضوع البحث كانت كافية لتحقيق الهدف: (أسبوعين إلى ثلاثة أسابيع)
7	Frequency: the average number of tweets per day was 2.8 (2-3 tweet/day).	معدل التغريد اليومي كان مناسباً: (2-3 تغريدات يومياً)
8	Quantity: total number of tweets was 40 tweets.	العدد الإجمالي للتغريدات كان مناسباً لتحقيق الهدف: (قرابة 38 تغريدة)
9	Timing: almost all tweets were published on the evening time 9-11 pm Saudi local time.	توقيت التغريد كان مناسباً: (9-11 مساءً بتوقيت السعودية)



## **Appendix 6: Pilot Participant Information**

### **Agenda setting through Twitter: influencing the agenda on road traffic accidents in Saudi Arabia.**

You are being invited to take part in a pilot study of a research project. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask me if there is anything that is not clear or if you would like more information my contact details are at the end of this sheet. Take time to decide whether or not you wish to take part.

Here are answers to some questions you may have:

#### **What is the purpose of the project?**

The project aims to explore and assess the use of Twitter to influence the framing of road traffic accidents in Saudi Arabia as a public health issue. This part of the project is a pilot which means that we are testing the process we plan to use to see how it works.

#### **Why have I been chosen?**

You are an active user of Twitter and a follower of the researcher's twitter account with some interest in the topic area.

#### **Do I have to take part?**

It is up to you whether you take part or not. You can agree to take part at the beginning but still withdraw at any time without it affecting any benefits that you are entitled to in any way. You do not have to give a reason.

#### **What do I have to do?/ what will happen to me if I take part?**

By accepting to take part in this study, you will receive – via email - the Twitter messages that will be used in the research project. In addition, you will get an evaluation form to complete with questions asking you about these messages and the process involved in receiving them. This form will take no more than one hour to read and complete.

#### **What are the possible disadvantages and risks of taking part?**

There are not any expected disadvantages or risks of taking part in this pilot study.

However, in relation to the main study project, as the incidence of Road Traffic Accidents in Saudi Arabia is high (rate: 24.8)\* a tweet could reach a participant who has themselves or has

family members that have been involved in serious and / or fatal car accidents. For any such participants raising the topic has the potential to cause psychological distress.

*\* Estimated road traffic death rate per 100 000 populatione (WHO (2013). Global status report on road safety 2013).*

**What are the possible benefits of taking part?**

You are unlikely to benefit directly from taking part in this research. However, the research results may in future influence and improve the provision of preventive road traffic accident activities in Saudi Arabia.

**Will my taking part in this project be kept confidential?/ What will happen to the results of the research project?**

All the information that we collect from you will be kept confidential. The data will be used by only the researcher to inform the main study design and processes.

**What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?**

Your participation relates to the pilot stage of the research project. The pilot testing will be undertaken before the main study to evaluate the messages and the tools that will be used in the study. Your evaluation, with others involved in this stage, will help the researcher in the design of the research study and the development of the Twitter messages which form the intervention. The results of the pilot will be used to inform the design of the intervention.

**Who is organising/ funding the research?**

The researcher is a PhD student in the Discipline of Health Promotion at the National University of Ireland Galway, in Ireland. This research is part of his academic work towards a doctoral degree.

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## Appendix 7: Intervention's tweets (Arabic)

- كقدرله قيمته في الحياة، بهتم الإسلام بالصحة ويفرض على المسلم التأكد من اتخاذ كافة الإجراءات الضرورية للحفاظ على صحته بصورة جيدة #يعطيك\_خيرها
- في الحديث عن الرسول صلى الله عليه وسلم: " نعمتان مغيبون فيهما كثير من الناس : الصحة و الفراغ " رواه البخاري #يعطيك\_خيرها #وزارة\_الصحة
- منظمة الصحة العالمية تعرف الصحة انها حالة من اكتمال السلامة بدنياً و عقلياً و اجتماعياً ، لا مجرد انعدام المرض أو العجز " #يعطيك\_خيرها
- تعرض 90% من أسر المتوفين في حوادث المرور لتدهور في مستوى و نوعية حياتهم لأسباب عادة نفسية و اقتصادية . #يعطيك\_خيرها #وزارة\_الصحة
- الصحة الجيدة مصدر رئيسي للتطور و النماء الشخصي و الاقتصادي و الاجتماعي ، و هي مهمة لجودة الحياة عموماً. #يعطيك\_خيرها #وزارة\_الصحة
- الصحة حق أساسي من حقوق الإنسان و هي مكون رئيسي للتطور الاجتماعي و الاقتصادي. #يعطيك\_خيرها #وزارة\_الصحة
- يجب أن يكون الناس قادرين على التحكم بصحتهم و كل ما يؤثر عليها من عوامل لينعموا بصحة جيدة في حياتهم. #يعطيك\_خيرها #وزارة\_الصحة
- الصحة ينعم بها الإنسان بعد عون الله باعتنائه بنفسه و بالآخرين و بقرارات صحية شخصية و بدعم من المجتمع الذي يحيط به . #يعطيك\_خيرها #وزارة\_الصحة
- حوادث المرور يمكن أن تؤثر سلبياً على كل أبعاد الصحة العضوية و الذهنية و الاجتماعية #يعطيك\_خيرها #وزارة\_الصحة
- في أوروبا أكثر من 150,000 معاق مدى الحياة من حوادث المرور . #يعطيك\_خيرها #وزارة\_الصحة
- أكثر من 50 مليون انسان في العالم يتعرضون لإصابات أو اعاقة سنوياً نتيجة حوادث المرور . #يعطيك\_خيرها #وزارة\_الصحة
- تعتبر حوادث المرور السبب الأول للإعاقة و الموت المبكر للأطفال من عمر 5 سنوات الى 14 سنة حسب منظمة الصحة العالمية . #يعطيك\_خيرها #وزارة\_الصحة
- تنتج اضطرابات و أعراض نفسية متعددة من التعرض للخطر الذي هدد حياة الناجين من حوادث المرور مثل اكتئاب ما بعد الصدمة . #يعطيك\_خيرها
- اكتئاب ما بعد الصدمة يشكل حوالي 40% من نسب الاضطرابات النفسية التي تصيب الذين تعرضوا لحوادث المرور . #يعطيك\_خيرها #وزارة\_الصحة
- الاضطرابات النفسية الناتجة من حوادث المرور لها أثر سلبي مباشر على علاقة الإنسان بالمجتمع المحيط به وعلى حياته الاجتماعية #يعطيك\_خيرها
- ترليون و 943 مليار ريال التكاليف المهذرة بسبب حوادث المرور عالمياً ، بدل صرفها على احتياجات و ضروريات المجتمعات و الافراد #يعطيك\_خيرها
- ثلث أسرة مستشفيات وزارة الصحة في السعودية يشغلها مرضى من مصابي حوادث المرور حسب تقرير سابق للوزارة . #يعطيك\_خيرها #وزارة\_الصحة
- نسبة 81% من المتوفين في مستشفيات وزارة الصحة كانت وفياتهم بسبب حوادث المرور . #يعطيك\_خيرها #وزارة\_الصحة
- السعودية عام 2012 تسببت الحوادث بوفاة 6458 و فاة نتيجة 485,931 حادث مروري ، و سببت خسائر بحوالي 21 مليار ريال . #يعطيك\_خيرها #وزارة\_الصحة
- حوادث المرور قضية صحية عامة يتولى مسؤولية الوقاية من أثارها الجهات الصحية بالإضافة لقطاعات اخرى كالأحزاب السياسية . #يعطيك\_خيرها #وزارة\_الصحة
- حوادث المرور مشكلة يمكن تحليل أسبابها منطقياً و لذلك يمكن بشكل كبير منعها و الوقاية من حدوثها بعون الله تعالى . #يعطيك\_خيرها #وزارة\_الصحة
- تعتبر البيانات الجيدة لتحديد مكونات المشكلة ثم تحليل هذه البيانات و تقييمها عنصر مهم في جهود منع حوادث المرور. #يعطيك\_خيرها #وزارة\_الصحة
- الأخطاء البشرية لا يمكن أن تمنع كلياً و لا يكفي التركيز عليها فقط بل لابد من الاهتمام أكثر بتصميم الطرق و المركبات . #يعطيك\_خيرها
- أي برنامج تدخل مجتمعي يجب أن يقترن ببرامج إعلامية مخطط لها بإتقان . #يعطيك\_خيرها #وزارة\_الصحة
- الحملات الإعلامية التي تستهدف التأثير على سلوك سائقي المركبات ستدعم البرامج التدخلية لمنع الحوادث . #يعطيك\_خيرها #وزارة\_الصحة
- حوادث المرور قضية صحية عامة مرتبطة بالدرجة الأولى بصحة الناس و حياتهم . #يعطيك\_خيرها #وزارة\_الصحة

